

# Railway Age Gazette

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## GENERAL NEWS SECTION.

\*Illustrated.

THE distant signal that figured in the Stamford collision was 1,800 ft. in the rear of the home signal; and both the Federal and the Connecticut commissions say that it should have been further back. The grade of the road is descending, at about 17 ft. per mile, or less. Inasmuch as many distant signals all over the country are less than 2,000 ft. from the corresponding stop signal, these governmental deliverances will attract general notice. They say that the distance should be greater for "fast" trains; but they do not say how fast. The Interstate Commerce Commission's report goes so far as to say that if the signal had been 800 ft. farther back, or 2,600 ft. in all, *there is every reason to believe that this accident would not have occurred*. That is a pretty strong statement. There is every reason to believe that Engineman Doherty knew the road perfectly, and that he judged distances independently of the location of the distant signal. The exact location of a distant signal is of value as a landmark in case of fog; but in this case the weather was clear, and the engineman shut off steam, he says, a good distance back from the signal and before he came in sight of it. He knew that, to stop at the home signal, he must do something besides wait for a sight of the distant. His error was not due to any miscalculation or misunderstanding as to distance. And, supposing that a distant signal is wrongly located; that it does not give room for a mile-a-minute train to stop after passing it; what is to be done? Obviously that train, in fog, must not be run at unlimited speed. In clear weather, the signal being visible 1,500 ft. back, the engineman has no difficulty. At Stamford, however, all trains being required to stop, a reduction to 40 miles an hour passing the distant would, very likely, be a reasonable rule in all weathers. We are not defending the use of improper locations; we are only calling attention to the fact that these commissions are going out of their way to discuss a small secondary point and one which, so far as the published evidence goes, has no bearing at all on this particular disaster. The government condemns the road for not having changed the location of this signal, when, quite likely, the officers were for the present fully justified in using their available money for other improvements which were more urgently needed.

ANOTHER secondary matter which is made unduly prominent in the Interstate Commerce Commission's report is that of the relative importance of a second section of a train as compared with the first section. The second section, in most cases, is more likely to overtake the first than the first is to overtake the train next preceding; but, often it is the fact that a half dozen trains follow one another so closely that the difference is non-existent. On a road like the New York division of the New Haven the term "section" has little meaning, so far as safety is concerned. Train 53 in some places is scheduled only seven minutes behind train 245. With the block system all trains are on absolutely the same basis. To the extent that an engineman depends on his knowledge of what train is ahead of him, or how far ahead it may be at any given point, to that extent he is weakening his respect for the block signals; and for these absolute obedience is the only rule. In saying that engines must always be changed at exactly the same place, and that such a rule is necessary as a measure for preventing collisions, Mr. McChord discredits the block system. The function of the block system, repeatedly recommended by the commission, is to protect every train equally well, whatever its location and whether it be standing or moving. This, again, is a question which has no bearing whatever on Doherty's case, for he fully intended to stop at the home signal, which was located in the rear of the standing train.

LOCOMOTIVE boiler design, particularly with reference to the firebox construction, and the proper methods of burning the fuel—as far as they have been understood in the different stages of progress in our understanding of the principles

of locomotive firebox combustion—have been considered of prime importance in developing efficient and powerful locomotives. It must be admitted, however, that more real progress has been made in our understanding of these problems within the past few years than in all the preceding years of locomotive development. And there is still much to be learned in these respects. Laboratory experiments of different sorts have been made to determine the direction of circulation of the water and steam in the water legs, but the results have been open to criticism because of the impossibility of duplicating actual conditions. Last year George L. Fowler developed a special apparatus for making such tests in a locomotive firebox and a few observations were made on the Jacobs-Shupert and radial stay fireboxes at Coatesville, Pa. These were not extensive enough, however, to be of much real value, except that they indicated a much lower velocity of circulation than had been expected, and also showed that there was practically no fore and aft movement of the water in the water legs—probably only enough to replace the water evaporated in them. In an article in this issue on the "Life of Locomotive Fireboxes," C. T. Rommel describes some simple laboratory experiments to determine the direction of circulation in different shaped water legs. While these are open to the same objections as other laboratory tests of this kind, the way in which Mr. Rommel has checked the results with the performance of fireboxes in actual service is of considerable interest. His conclusions as to the necessity of applying the firebox sheets with reference to the direction of rolling of the sheet and as to the single piece firebox are also valuable.

#### THE LIMITATIONS OF REGULATION.

THE Interstate Commerce Commission's report on its New England situation investigation, in the opinion written by Commissioner Prouty, analyzes in detail the service, rates and finances of the New Haven and the Boston & Maine, and concludes by setting forth some rather sweeping expressions of opinion of national importance. Specific instances are cited in this report of that very high handedness in the management of public service corporations' affairs that has led to regulation, yet the report itself, in leaving a loose end for every subject discussed, marks the limitations of government regulation of privately-owned enterprise. Since, however, the general conclusions are at least in part based on the commission's findings of fact in the New England situation, it is of the first importance that these findings of fact should be thoroughly understood.

In commenting on the annual report of the New York, New Haven & Hartford for the year ended June 30, 1912, the *Railway Age Gazette* said: "From a superficial examination of the railroad company's showing in 1912, exclusive of outside operations, it would appear that the operations of the railroad itself would have been highly profitable if the company had not extended its credit and increased its dividend and interest requirements by the acquisition of boat lines, trolley lines, etc." The commission, in its report, criticizes under two heads the New Haven's outside operations. It finds that these outside financial operations have been "wasteful in the extreme" and that the "company could have done business without advance in its transportation charges and have continued to pay the stockholders a dividend of 8 per cent. had it been content to confine itself to the mere operation of its railroad property." The question of whether or not the New Haven's acquisition of trolley and boat lines was wasteful in the extreme is a specific one, and the commission's charges in this respect are serious. The question of whether or not the railroad company could have continued to do the business that it is now doing and earn the rates that it is now earning, if it had not taken steps to prevent competition, is one in regard to which there may be an honest difference of opinion.

The Interstate Commerce Commission to a certain extent shirks a consideration of this question under the orthodox expressions of abhorrence for monopoly; but that is not judicial;

the practical question cannot be turned off with simple expressions of high sounding principles.

Mr. Mellen was faced with a very serious problem. Let us take two specific instances. The New York & Stamford street car line runs from New Rochelle, where it connects with the New York city railways, to Stamford, Conn., paralleling the New Haven for the entire distance. Franchises for this line were obtained before the Mellen régime. The New York & Stamford trolley line could not under any circumstances have cost \$15,000 a mile to build. The four-track, stone-ballasted electric railroad which it parallels, with no grade crossings, with complete block signals and laid with 100-lb. rail, treated ties, screw spikes and every modern appurtenance of a railroad, cost between \$100,000 and \$200,000 a mile. The trolley line could not possibly furnish satisfactory commutation service into New York; it could not possibly furnish satisfactory through passenger service from any point on its line for the great mass of busy people into New York; it could not carry bulk freight; it could not carry coal; it could not form a link between a railroad beginning at Stamford and extending into New England. On the other hand, with fixed charges as low as \$700 a mile, it could have inaugurated an express service, a light freight service and a local passenger service at rates utterly prohibitive to the New Haven.

Another example: The New Haven's industrial department persuaded a manufacturing concern to locate on one of its branch lines in Massachusetts. It ballasted this line, laid heavy rails, gave the manufacturer a satisfactory rate on inbound coal, and in short made the possibility of the successful operation of this concern. A couple of years later a branch was thrown off from a nearby trolley line to the back door of the factory. The New Haven had been doing a passenger business, made up of workmen going from and to the factory, which, although not in itself particularly profitable, helped to pay the interest charges on this particular branch line. The trolley line, with its lower fares, quickly took away this passenger business. It then put on an express car which made a bid for and obtained small package shipments from the factory. Since the factory's business consisted very largely of comparatively small package shipments, another and another car was put on, until within less than a year the New Haven was left with the unenviable burden of supplying coal to the factory, which coal could command only about six mills per ton per mile, and of taking out what bulk freight the factory found it inconvenient to give to the trolley company. Yet the factory could not have existed without the railroad, and public opinion would not for a moment have tolerated the New Haven's abandoning its branch, not to mention the fact that there would have been no way of getting back the original investment if the company had abandoned its branch.

This was typical of the situation that Mr. Mellen had to face. Back of Mr. Mellen was the late J. P. Morgan, whose ideas of the evils of competition are embodied in the United States Steel Corporation and, in the very words, "community of interest." All of these considerations the commission has passed over with the generality of an expressed belief in competition.

There was another way in which this competition, which the New Haven has met by overwhelming force of dollars, might have been met. There is an example of what we mean in what may fairly be called a monument to the genius of American business methods which has been built up by Theodore N. Vail in the American Telephone & Telegraph Company. The American Telephone Company has had to face potential competition almost everywhere, and actual competition in many places; and the Western Union Telegraph has had to meet competition almost everywhere; but both telephone and telegraph have been markedly successful. And the public has been given a generous share of the fruits of this success. Might it not have been possible for such a genius as Mr. Vail to have taken a railroad like the New York, New Haven & Hartford, with almost unlimited financial resources, with a public quick to appreciate good service and fair treatment, and have forestalled competition by the very excellence of the service rendered?

Quite properly, this question is not even remotely touched on in the I. C. C. report; nevertheless its absence throws into clear relief the inherent weakness of government regulation of a privately owned business. Even such a highly expert and judicial body as the Interstate Commerce Commission is obliged to content itself with destructive criticism. It is true that in Commissioner Prouty's opinion more than ten printed pages are devoted to what is headed "The Remedy"; but a close reading of this opinion only leads to the conclusion that the remedy itself is negative, not positive.

The commission, as previously mentioned, divides its investigation into an analysis of service, rates and finances. As to passenger service, the commission says: "These records show that the New Haven in the past two years has distinctly surpassed any other line terminating in New York City. . . Safety of operation was not considered in this proceeding."

As to freight service, the commission finds that "the statements furnished by these outside lines show that the service of the Boston & Maine is much less reliable than that of either the Pennsylvania or the Baltimore & Ohio, while that on the New Haven is slightly inferior to the Pennsylvania, but about on a par with the Baltimore & Ohio. It is needless to observe that the time covered is so short that not much weight should be attached to the result." As to rates, the commission says: "Our examination, which has been a rather extended one, fairly indicates that freight rates between points in New England, while somewhat higher in many instances, compare favorably upon the whole with those in trunk line territory and central freight association territory. \* \* \* The long distance rates are lower from and to New England than in most other sections; its passenger fares have been more favorable to the local traveling public than in any other portion of the United States."

As to rates, the commission's findings are conclusive; as to service, it must be said, with the utmost deference to the commission, they appear to be superficial. Indeed, the commission with surprising frankness acknowledges this when it says, as quoted above, that "it is needless to observe that the time covered is so short that not much weight should be attached to the result." In studying passenger service, for instance, the commission took the most readily available figures, those furnished to the New York Public Service Commission showing percentage of trains on time. Percentage of trains on time, without any analysis of schedule, of frequency of service, of convenience of service, of territory covered, etc., means almost nothing.

In regard to the New Haven's finances, the commission's criticisms are more definite and far more serious, but still incomplete. The basis on which these criticisms are made really amounts to an acknowledgment that the commission, with all its powers of examination of books and witnesses, is unable to explain transactions which on their face look improper.

The commission makes the definite accusation in regard to the formation of the Rhode Island company and the acquisition of the Rhode Island trolley property that "in whatever aspect the transaction is viewed, the New Haven gave \$13,500,000 for nothing"; but concludes its comments on this subject with the futile, "the inevitable query is, what was the motive behind this transaction, and who made the profit? That question in the very nature of such transactions never can be satisfactorily answered." In regard to the New York, Westchester & Boston, the commission says: "Here, therefore, is an enterprise which has cost the New Haven company \$12,000,000 in excess of the value of its property upon its own showing. Again the question arises, what has become of this \$12,000,000?" In regard to the Billard-Boston & Maine transactions the commission says: "And upon this record as it stands the New Haven company has given away of the funds of that company to Mr. Billard and his associates, or to the stockholders of the Billard company, whatever that may be, between \$2,500,000 and \$3,000,000 of the property of the New Haven company."

In regard to the Mellen notes, of which so much was made

in the newspaper comments on the hearings, the commission acquits Mr. Mellen of making any improper personal gain, but adds: "If a shipper were to obtain a refund of an overcharge in the amount of 25 cents, he would be required to execute a voucher for the same and properly so; if the president of this corporation expends money in connection with the purchase of a lease, he should take a voucher for the same. If the expenditure is not such that a voucher can be taken, it ought not to be made."

Summing up the ten pages of "The Remedy": The railroad situation in New England is in need of "rest and an opportunity for constructive work;" the New Haven should divest itself of its trolley lines; the Boston & Albany should be kept entirely free from the New Haven control; the merger of the Boston & Maine and the New Haven is left almost where it was before. "If it be asked what is to be gained by the merger from an operating and traffic standpoint we answer 'very little.' \* \* \* If it be asked what is lost through the merger from an operating and traffic standpoint, the answer must be 'something substantial but not of great territorial extent'; the remedy for the apparently inadequate revenues on the Boston & Maine consists in a conclusion "upon the whole to continue the present investigation as to this particular subject," and, finally, the commission expresses the opinion that the following propositions lie at the foundation of all adequate regulation of interstate railroads:

1. Every interstate railroad should be prohibited from expending money or incurring a liability or acquiring property not in the operation of its railroad, or in the legitimate improvement, extension or development of that railroad.

2. No interstate railroad should be permitted to lease or purchase any other railroad, nor to acquire the stock or securities of any other railroad, nor to guarantee the same, directly or indirectly, without the approval of the federal government.

3. No stocks or bonds should be issued by an interstate railroad except for the purposes sanctioned in the two preceding paragraphs, and none should be issued without the approval of the federal government.

This regulation of the issue of railroad securities, the commission finds, can only be administered through the national government. The commission does not say whether or not it accepts the suggestion of the Hadley Securities Commission that federal incorporation of railroads be permitted; neither does it give any explanation of how the federal government is to take jurisdiction over the issue of securities by a corporation which is a citizen of a particular state and heretofore considered subject to the laws, in this regard, of the state which created it.

As was pointed out at the beginning of this discussion, the two definite recommendations in regard to the limitation of the activity of railroad corporations are based on the findings of fact of the commission in this case, and the weight of the commission's opinion on this matter is in direct proportion to the completeness and finality of its analysis of facts. The commission asks for further powers of regulation, but since 1907 it has had final and sweeping powers over the accounting practices of railroad companies and it is the New Haven accounting and not the railroad service and rates that the commission finds indefensibly bad. Neither corporations nor people can be regulated into being good, neither can a man be regulated into being a great railroad president. Herein lies the limitation of government regulation of railroads.

#### A NEW ARBITRATION LAW.

CONGRESS has amended the Erdman law so as to provide for boards of arbitration of six members; and the headlines of the daily papers, agitated last Sunday and Monday over the alleged prospect of a strike of the conductors and brakemen of the Eastern railroads, have become calm. The railroads will now be ready to arbitrate. This amendment—the Newlands bill, substantially as given in the *Railway Age Gazette* of June 13, page 1328—will put real efficiency into a law which, during the 15 years of its existence, has been only a fragile structure, of the most temporary kind; and yet this weak bridge has had to be traversed by some very heavy trains. And second only to the provision for

a reasonable number of arbitrators is that for employing a commissioner of mediation, to give his time exclusively to that office. In the performance of his duty this mediator will be joined by two other men, officers of the government, who, like the conciliators under the present law, have other duties taking up most of their time. This may not be in all respects an ideal arrangement, but there is good ground for expecting a decided clearing of the air. Arbitration, as between the great railroads and their employees, may now be regarded as a permanent policy. The theory that the public will not on any consideration permit a general suspension of traffic being once conceded, the railroads have no alternative but to accept any reasonable scheme of arbitration. In the new law this condition is for the first time attained. The permanent mediator is not, probably, a vital factor; but if he be a strong man he will have almost unlimited power for usefulness.

The need of a permanent officer to perform these functions of the government grows more and more pressing each day, as important questions, bewildering in their number and magnitude, constantly arise. Moreover, the time is at hand when employers must take an aggressive course; and Chairman Elisha Lee has already intimated, in his letter to the employees, that this will be done.

The railroads having had to bow to the decree of public opinion that the welfare of the people demands arbitration of disputes between employers and employees; and, the machinery of arbitration having been established on a permanent and workable footing, it will then be proper to refer to it all disputes between railways and their employees, of whatever character. Hitherto all arbitrations have been simply adjudications of demands made by employees. The result always meant a complete or partial submission by the railroad company to agreements calling for increased wages or better hours or conditions, or both. But it will be in every respect as reasonable for the railroads to go before the governmental authorities with a demand that wages be cut down, or privileges curtailed. When a railroad can show in convincing manner that certain classes of its employees are receiving far more than men receive in other trades or occupations which call for similar qualifications, and when at the same time it is confronted with the necessity of making large expenditures for improvements in structures or equipment which do not add to its income, and which improvements are forced upon it by the public, why should it not have the privilege of calling on the governmental board to take up all questions involved, and see whether a reduction of wages would not be equitable?

In the controversy now pending, that between the conductors and the brakemen and their employers in the Eastern states, one of the first points to be considered by any board of arbitrators will be the claim of the railroads that the men are already well paid for their work. A general businesslike investigation of the wages of all classes of railroad employees is a very different thing from a superficial attempt to conciliate both sides to a quarrel—which usually means only a splitting of differences—but it should go without saying that the former is the only dignified thing for a government to do.

Of course, a commission of conciliation cannot be expected to bring the millennium. Final decisions in all strenuously contested cases will still rest with arbitrators who must be chosen in each case. But if the president shall appoint a strong man, of the right character and reputation, it is not too much to hope that the relations of the railways and their employees will enter upon a new and less troubled era. A mediator free from temporary influences can give to the public much important truth which now is obscured. By the educational influence of conciliation, and by his influence between times, when employers and labor leaders are not confused by strife, he can enlighten the people (and the railways) on all sides, and improve the quality of the arbitrators' work. The railroads have too long played the role of benevolent paternalism. Employees have asked for better pay or conditions and negotiations have been conducted ostensibly as though between equals; but in point of fact many secondary features in these negotiations have been settled by the railway

waiving its right to argue its points. As one railroad officer puts it, "the employees have been ready to arbitrate up but never to arbitrate down"—and the employers have acquiesced in this course. This, as we have said, is only benevolent paternalism. But now things are changed. Railroad officers, instead of being rich barons, conferring favors on their poor employees, are more in the position of administrators of a precarious business, contesting with a body of employees who not only "feel their independence," but, having the backing of the government and the press, and enjoying the wealth of high wages, have good ground for such a feeling.

#### THE CAUSE OF THE STAMFORD COLLISION.

THE Interstate Commerce Commission's report on the Stamford collision confirms the conclusions which were reached on the first publication of the facts, and which were given in our issues of June 20 and 27; that the cause was a mistake of judgment on the part of Engineman Doherty; that his lack of experience with fast trains explains how he came to make the mistake, and that no officer of the company had taken measures to assure himself of Doherty's competency. The report says that the company has no adequate regulations for securing and recording such assurance when men are promoted. It does not give the testimony on which this statement is based, nor does it publish the names of those who gave it; but as the company has issued a defense or apology and does not deny the statement, it must be accepted as one that is well founded. Commissioner McChord lays the responsibility for this lack of necessary safety measures on the company and its operating officers, naming no one. The report specifies the neglect of the road foreman who was nearest to Doherty and who, apparently, was directly responsible for him, but beyond that the commissioner's inquiry evidently did not go. On the questions as to who appointed the road foreman, or how it came about that he did not appreciate his responsibilities, we are left in the dark. The "operating officers" are blamed as a body. The general manager, however, is in effect exonerated because of the short time that he has held that office.

For Doherty there will be general commiseration. A sensitive and conscientious man in his position will naturally take the whole responsibility; for the blame that is placed on others can give him no comfort. The roundhouse man did not settle with Doherty about the notation on the book concerning unsatisfactory brakes; but he (Doherty) on the return trip handled his train cautiously, because of not having been satisfied by the repair man, and so there is no question that he knew that the difficulty which he had complained of still required his careful attention. The alleged inadequacy of the brakes on the cars is also worthless as a palliation of the final error, for after having braked the train three or four or more times between New Haven and Stamford, the engineman knew what he had to deal with. Even if the brakes had been far less efficient than they were, he was bound to know what he could expect from them. The testimony of men from the Lackawanna and the Pennsylvania that the brakes on the cars were not 100 per cent. perfect, or that a train in that condition would not be started on their roads has no particular value for Doherty; while the two other runners who had handled those cars on that trip testified that they had found no serious fault with the brakes. The facts in regard to these cars, taken with the testimony concerning laxity at the Cedar Hill inspecting station, may indicate that the air brake standards of the New Haven road are not so high as they ought to be; but the report is too fragmentary and incomplete to warrant any conclusions on this point; and, as we have said, no conclusion would help Doherty. An engineman who has poor brakes has not the slightest warrant for running as though he had good ones.

In certain secondary matters the report of the commission is criticised in another column. It is open to criticism also for its superficial treatment of the question of steel cars. The substi-

tution of steel for wooden passenger cars is a matter involving grave financial problems, and yet these seven judicial gentlemen deal with it in the terms of the stump speech. They call for mandatory legislation, apparently assuming that to renew forty thousand wooden passenger cars at a cost of half a billion dollars would be as simple a task as to comply with the law which requires the 2,000 wooden mail cars of the country to be replaced with steel cars. Railroad managers understand the advantages of steel cars and are introducing them rapidly. To require the change to be made "at the earliest possible time" ignores the demands of other elements of the transportation plant which need money for maintenance or improvement. It cannot too often be repeated that the prevention of collisions is a duty which precedes that of ameliorating the conditions which follow a collision.

The question of the brotherhood's bad influence on discipline has not been much illuminated by the Stamford case. The *Evening Post*, of New York, called on the commission to make a "clean cut" report on this branch of the subject; but the railroad company made out such a poor case that no definite issue was raised. Even after the commission's report came out, the road issued a statement to the effect that Doherty's services had been "practically forced on the company by the enginemen" (though the general manager, in his testimony, said that he had not been coerced); but no definite evidence was presented. Mr. Bardo demanded that two years' service as engineman should be the qualification for taking charge of through passenger trains. He accepted a rule requiring only one year, because, for one reason, there was no evidence but that one year was enough. Being new in his position he compromised. The enginemen's committee seem to be chargeable with a very poor appreciation of their responsibility in this matter, for they were negotiating for a petty technical advantage when they, of course, must have known of the lack of adequate regulations for testing the qualifications of candidates for promotion. They, in effect, helped Doherty get himself into trouble by taking a job which he had not sufficiently studied. The real trouble was not a question of any particular number of years or months; it was the lack of means for training the runners; and for this the company can give no justification.

We have said that this case does not illuminate the question of labor union influence. But it is very suggestive, nevertheless, for it is just such indirect, evasive actions as this case discloses which figure in a large proportion of the charges of improper influence. Grievance committees do not directly demand that the superintendent shall do something bad; they ask for the postponement or modification of something good. When finally pinned down, they will not dispute the justice of a given punishment; they will plead with the superintendent to shut his eyes and suspend sentence. The railroad officer who has to administer discipline needs the wisdom of Solomon, the persistency of a Washington lobbyist, and the backbone of Grover Cleveland.

#### NEW BOOKS.

*Manual of Statistics; 1913 Edition.* Published by The Manual of Statistics Co., 20 Vesey street, New York. 1,104 pages. Price \$5.

The 1913 edition of this manual, which is the 35th annual issue, covers, like its predecessors, a very broad field. The very rapid incorporation of industrial concerns during the last few years has added a great number of names to the list of those which must be covered by any statistical manual including industrial companies. The 1913 edition of the Manual of Statistics, therefore, contains information in regard to numerous companies which have not before been included in this or like publications. In addition to giving mileage income balance sheet, etc., figures for railroads and industrial companies, the manual contains a very complete list of government securities and of the securities dealt in on the stock exchanges of all the principal cities of the United States, giving the high and low prices for the year.

## Letters to the Editor.

### AN EARLY LOCOMOTIVE BOILER EXPLOSION.

LEICESTER, England, July 2, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In the *Daily Railway Age Gazette*, of June 16, 1913, page 1411, I have seen with much interest the illustrations of the headstones of the engineer and fireman killed in 1840. However, I beg to say that it is not fair to the firm of Norris & Company, of Philadelphia, Pa., to say that the engine was built by them, or even built in America at all.

I have before me the official report of the explosion which was ordered by the House of Commons to be printed, March 8, 1841. Therein it is clearly stated that the engine in question was at the time the property of S. A. Goddard, having been built in Birmingham (England) for Dr. Church.

The Birmingham and Gloucester Railway Company allowed the engine to be tried on their rails, but it was not their property. The inquest proved that the boiler plates were not strong enough.

CLEMENT E. STRETTON.

### POWDERED FUEL AND EXPLOSIONS.

ALTOONA, Pa., July 10, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I thank you very much for calling my attention to the criticisms of one of your readers concerning the lack of information in my article on Powdered Fuel for Locomotives (*Railway Age Gazette*, July 4, 1913, page 13) as to its liability to explosion.

I can say positively that there is absolutely no danger of explosion of powdered fuel where ordinary sensible precautions are observed. The writer has worked in cement mills, burned powdered fuel himself, and knows whereof he speaks. In the first place, powdered fuel when in storage or in bulk, or on being blown into furnaces does not explode. It may puff or flare back slightly when starting up a fire in a furnace, etc., if there is not enough draft, but even this is preventable. There have been so-called explosions of powdered fuel, several of them, but not one person in ten has any idea what they are like. Several of the large cement companies, including the Atlas, Alpha, Edison and others, have had explosions, fatal ones, killing several men, but every one to my knowledge originated in the grinding room where the coal was pulverized. They are sometimes caused by a nail getting in the mill and causing a spark; sometimes by open flame when cleaning or repairing a mill. All these explosions are caused by impalpably fine dust floating in the air in suspension. This floats in layers or strata. Nails and all other pieces of iron should be removed by an electromagnet before the coal goes to the mill, even if only to protect the mill from damages. At a recent explosion (?) in one of our biggest cement mills the facts are as follows:

A foreman and some of his men were repairing and cleaning a mill. One of the men had rammed a piece of waste on the end of a stick into a part he was cleaning and somehow (no one knows) it caught fire as he pulled it out. Immediately there was a swift hissing sound like a pinwheel going off, or escaping steam, and in a flash this indescribable death traveled the length of the room, down a stairway and back several times in layers just like a train of powder, only there was no report, no explosion, just a hissing. The men came out—they were absolutely denuded, yet seemed to retain all their faculties. The foreman said: "I'm done for and am going to die." He still had enough life in him to tell what had happened before he became unconscious. They all died very shortly afterward.

As terrible as this seems, it is entirely preventable. I have never seen a cement mill yet where you could go near the coal pulverizing room, much less in, without soon becoming covered with coal dust. Yet at the American Iron & Steel Company's plant in Lebanon (they use powdered coal exclusively and have

for eight years) I stood inside the grinding room and laid a white handkerchief on my sleeve and it caught not a grain of dust. Needless to say this concern will have no explosions. The cement mills seem to think it cheaper to take a chance as long as things keep running than to spend enough money for safety. The Edison plant, after its fatal explosion, ground its coal much coarser, but if it was ground only one-fourth as fine it would still have a certain percentage of impalpable dust which is liable to explode.

There are two ways to be safe—use a mill that is tight, and spend enough money for competent labor and materials to keep it in repair.

Now as to the storage and burning. Coal, pulverized and stored in tanks, is 100 per cent. less liable to explosion than oil. It sometimes catches fire from spontaneous combustion or otherwise, and nothing happens any more than what would happen if a pile of slack coal caught fire. It is not even necessary to shut down. All that is necessary is to go right on drawing it off in its semi-burnt state, cutting off the supply to the bin that is afire, and burn it till it is all out of the tank, when a new supply may be put in if the tank has not become heated, care being first taken to see that none of the burnt coal remains.

In a large cement mill where I was employed, I have many times had to walk along the iron gallery in front of the supply boxes. This gallery is practically right over the front end of the kilns and only 8 ft. above them. The coal dust which has overflowed the boxes is always from 2 to 4 in. thick on this walk. Even when careful (which no one is) a person kicks showers of this fine dust right down over the open red hot end of the kilns; it is sometimes kicked down over a new man for a joke. Clouds of this drift down over the kilns and are harmlessly sucked in by the draft. Certainly no severer test than this could be desired.

Powdered fuel is safe—safe as coal in chunks, if common sense and judgment are exercised—and any one who believes to the contrary is simply laboring under a misunderstanding of the facts in the case.

Open dryers should not be used, i. e., dryers in which the heat and flame come in direct contact with the slack coal. This is dangerous and should not be tolerated, though some concerns use it. There are plenty of good compartment dryers on the market which are safe.

W. D. Wood.

#### INCONVENIENCES TO THE TRAVELING PUBLIC.

NEW YORK, July 11, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I was very much pleased with your comment in the *Railway Age Gazette* of July 4, 1913, page 1, on the endeavors of the railroads to conciliate the traveling public, and the action of one president in employing a man to travel over his road and to report to him items from the passenger's standpoint. In my opinion, what is greatly needed today is a harmonious condition between the railroads and the public. This can be brought about by eliminating the little inconveniences over which people make so much trouble, and by taking the public into the confidence of the roads and explaining the railroad side of all situations to them.

The human mind, as well as the human body, is very peculiarly constructed so that the average individual makes more fuss over a small injury, or a small inconvenience, than he does over a serious illness or some great trouble. In railroad travel it is the little things that annoy the public and cause it to take sides against the railroads.

In many stations great inconvenience is caused to the passengers, and also considerable risk, by the manner in which the baggage trucks are handled. It is quite customary for three or four men to charge down upon a body of passengers, sometimes with loud cries of "get out of the road," and at other times without even this discourteous warning. At a station the

other day the writer saw a passenger rolled over with a truck and only saved from serious injury by the quick action of an usher who, at considerable risk to himself, sprang across a track and saved the man from falling under an approaching train. This method of handling the trucks is absolutely unnecessary, and its elimination would certainly appeal to all travelers.

Considerable inconvenience and some trouble is also caused by moving trains after they have been opened to receive passengers. It is very easy, by this action, to throw a passenger and cause some minor injury. A very frequent sight is a nervous passenger, usually a lady, rushing after one of these moving trains because it is supposedly leaving the station. When trains are open to receive passengers, they should stand still until the passengers are aboard and the train ready to go.

At a number of stations the passengers are invariably herded behind the gates until the last few minutes before a train is ready to start, and then must file by a guard and have the tickets punched. In many places no judgment is used in this matter, and no matter how great the crowd, it must all pass through one gate in a small space of time. This evil has been recognized at the Broad street station of the Pennsylvania Railroad. Whenever there is an unusual crowd two, and sometimes three, gates are opened. At other places this is never done, and the writer has even been stopped when he went through a gate opened for a local train, and then attempted to cross over behind the trains to the one he wished to take. He was stopped for the reason that his ticket had not been punched.

Why punch the tickets? What useful purpose does this procedure fill? The writer can readily understand how it is a protection both to the travelers and to the railroad to have the tickets examined and thus make sure that each person is getting aboard the proper train, but why delay and annoy the passengers by punching the tickets?

The porters, who were originally employed to assist the passengers, have become in some places the greatest nuisance around the station. They are worse at the Grand Central station in New York than anywhere else. At this station they so crowd around the vestibules of the trains, that a passenger can only alight by pushing them aside. Not only this, but frequently a few of the porters, who have been a little late in noticing the arrival, come charging down the platform, causing the passengers either to get out of the way or be run over. These porters are supposedly employed by the railroad company to assist passengers free of charge, but I have yet to see one of them assist a passenger where there is no prospect of paying. In fact, a common sight in stations is a mother with several small children, and a couple of bags, doing the best she can to get through the station unassisted, while the prosperous looking man with a small satchel of a few pounds weight has a porter.

These are of course small items, but they cause great annoyance and inconvenience, and moreover could be remedied at no expense to the railroad.

C. J. MORRISON,  
Chief Engineer, Froggatt, Morrison & Co., Inc.

NEW LINE IN HAITI.—Very slowly has railway progress proceeded in Haiti, but latterly further and more successful efforts have been made to open up some of the little-known back country to the railway. The latest addition to the limited mileage is 19 miles from Gonaives to Ennery, which have been built for the Haitian government by the National Railroad Company. The line boasts of two bridges, one depot at Gonaives, stations at Gonaives, Passe-Réine and Ennery, a machine-shop at Gonaives and one or two small outbuildings. The rolling stock consists of two Baldwin locomotives, one first-class passenger-car, one second-class, and two third-class cars, as well as two box-cars, two cattle cars and two flat cars. Further construction, but still upon a modest basis, is to be undertaken by the same company.

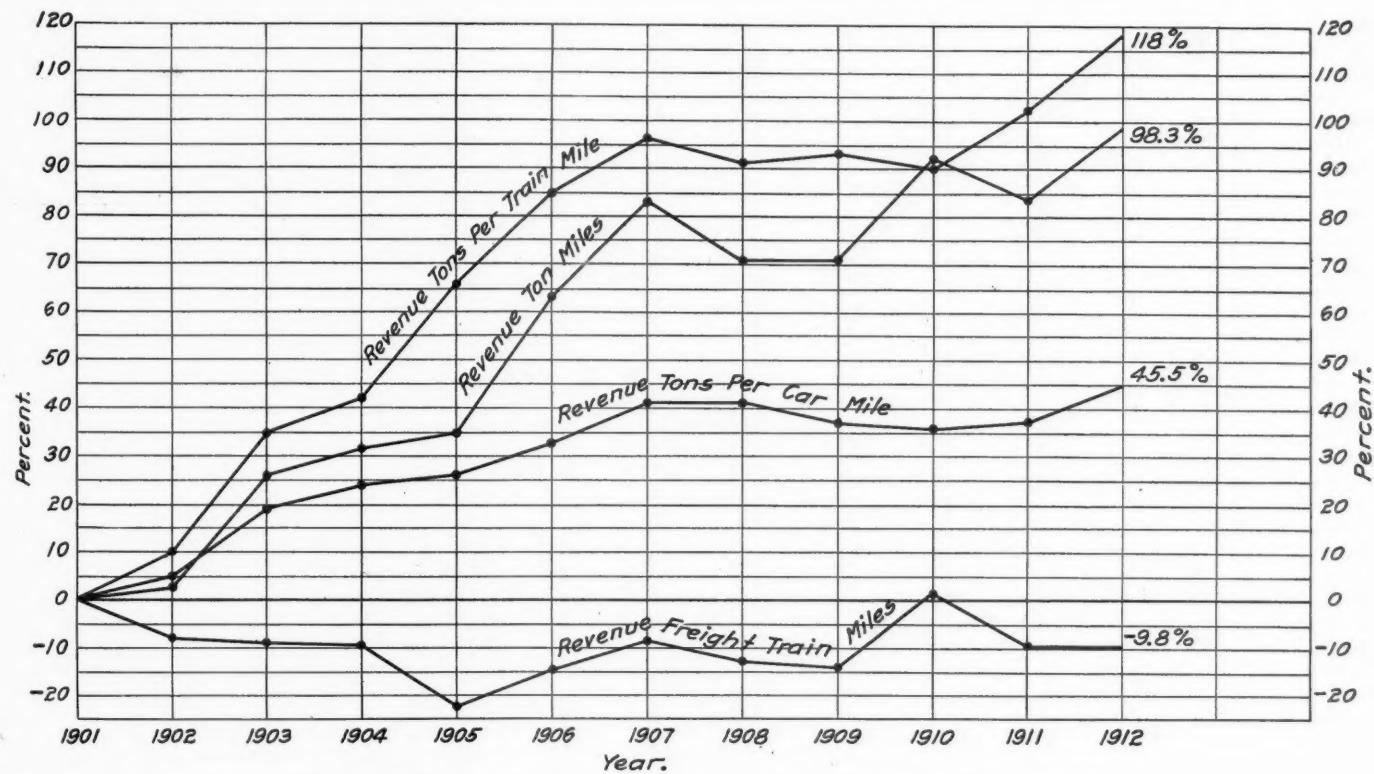
## STUDIES OF OPERATION—THE C. B. & Q.

A Growth in Freight Traffic from 1901 to 1912 of 98.3 Per Cent.  
Was Handled with a Decrease of 9.8 Per Cent. in Train Miles.

In 1901 the Chicago, Burlington & Quincy moved 3,871,337,916 revenue ton miles of freight with a revenue freight train mileage of 18,397,431. In 1912 this road moved 7,675,979,757 revenue ton miles of freight with a revenue freight train mileage of 16,688,629. In other words, although the amount of business handled by this road *increased* 98.3 per cent, in eleven years, it was moved with an actual *decrease* of 9.8 per cent. in revenue freight train mileage. This result was brought about by an increase in this same period of 118 per cent. in the revenue train load. As the expenses of a railroad depend very largely upon its train miles, and net earnings naturally respond to an increase in the train load, a record so unusual as that of the Burlington can be studied to good advantage. Efficient railway operation may be summarized by the statement that the earnings are measured in ton miles while the expenses are counted in train miles. Few

fluctuations in business. It is also interesting to note that although the train loading decreased slightly when the business fell off in 1907, it did not fall to the same extent as did the business, again illustrating the same difficulty.

The results obtained in the operation of the Burlington are best emphasized by a comparison with the corresponding figures on other roads operating in the same territory and carrying largely the same general traffic. The Chicago & North Western, Chicago, Milwaukee & St. Paul, and Chicago, Rock Island & Pacific are the roads most directly comparable with the Burlington. Thus, while the average revenue freight train load on the Burlington for 1912 was 438 tons, the train load on the North Western was 299 tons, that on the Milwaukee was 288 tons and that on the Rock Island was 278 tons. On the other hand, the Great Northern train load was 601 tons. In 1902 the



Increases in Traffic and Train Load on the Burlington as Compared to 1901.

opportunities have been offered for as clear cut a comparison of different methods of operation, and the results secured by the Burlington are of unusual interest for this reason.

That these increases in revenue ton miles and revenue tons per train have not been the result of a spurt occasioned by unusual conditions, but rather of a steady development of operating methods, is best shown by the accompanying diagram, from which it can be seen that the increases are fairly uniform in direction. Their upward inclination in 1911-12 also indicates that the limit has not yet been reached. It is interesting to note that since 1902 the average freight train mileage has been comparatively constant and the large increases in traffic have been taken care of by increasing the train load. It should also be noted that the rate of increase in the train loading has been above that of the traffic at all times during this period except in 1910, when, coincident with the large increase in traffic, there was a slight decrease in the train load and a corresponding comparatively large increase in train mileage, illustrating the difficulty of adjusting operating conditions promptly to wide

average revenue freight train load on the Burlington was 200 tons, on the Rock Island 178 tons, on the North Western 232 tons, on the Milwaukee 237 tons, and on the Great Northern 381 tons. Thus, while the train loads have shown a creditable increase on the other roads, they have not increased to nearly the extent to which they have on the Burlington or Great Northern. Therefore these increases are not to any large degree the result of local conditions in the territory through which the road operates. This comparison should not be taken as a criticism of the North Western, St. Paul or Rock Island, for these roads are generally recognized as being very well operated and maintained, but is meant merely as a comparison of the results gained by different methods. This difference in the results of different methods has been strikingly illustrated very recently on the Baltimore & Ohio. Although it is less than three years since President Willard, who was formerly operating vice-president of the Burlington, took charge of the Baltimore & Ohio, the revenue train load was increased last year 114 tons over that of the year before.

That the high train loading of the Burlington is not due to a preponderance of trunk lines between important commercial centers is best shown by the fact that 53 per cent. of the mileage of this road consists of branch lines which produce only nine per cent. of the traffic, and that 91 per cent. of the total business is handled on the remaining 43 per cent. of the lines. The Burlington has long followed the policy of intensive development of its territory by the acquisition of branch lines or feeders, as is especially evident from a study of the railway maps of Central Illinois, Southern Iowa, Northern Missouri and Southern Nebraska. While valuable as feeders, these branches seriously retard the development of high average train loads.

The class of traffic handled very materially influences the train loading of any road. The traffic handled by the Burlington is largely the same as that of the other roads in the same territory, but its average haul is 255 miles, as compared with a haul of 138 miles on the North Western, 192 miles on the Milwaukee and 242 miles on the Rock Island. This factor is of material assistance to the Burlington in increasing its train loading. Also, the Burlington is now a heavy carrier of coal. About 32.2 per cent. of all freight traffic handled by it in 1912 was bituminous coal and 41.6 per cent. of its business was products of mines. This traffic lends itself readily to heavy train loading and has been so developed on the Burlington as to give a long haul; the haul on this traffic being considerably above the average haul on all traffic. On the other hand, the Burlington handles a smaller amount of iron ore or forest products than either the North Western or the Milwaukee. It also handles more live

and a maximum grade of 0.2 per cent. While the mileage of main line has increased from 7,789 to 9,074, or 16.5 per cent. in the 11 years, the percentage of second and third main tracks to first track has risen in the same period from 5.8 per cent. to 8.7 per cent. In the same period the mileage of side tracks has increased 52 per cent. and is now equal to 28 per cent. of the main track mileage, comparing very favorably with that of other roads in the same territory.

Large amounts have also been spent in raising the general standards of maintenance. While the earnings of the Burlington have increased rapidly with the increase in train loading in spite of the fact that the average rate received per ton mile has steadily fallen from 8.6 mills in 1901 to 7.5 mills in 1912, the policy of the management has been to return into the property all earnings after the payment of fixed charges and eight per cent. upon the stock. Thus, while the capitalization is only \$33,500 per mile, and is now actually less than it was 10 years ago, the property has been very generally improved and is in excellent physical condition. The expenditures per mile for maintenance for the last five years were \$7,590, or an average of \$1,518 per year, which is considerably above that of other roads operating in the same territory.

In making improvements of any magnitude, the needs of the line and the results to be secured are very carefully studied. Special attention has been given to a study of branch lines to determine where expenditures for the improvement of the roadbed and structures would permit heavier train loading and the use of heavier locomotives. In some instances the improvement

Year Ending June 30.	OPERATING STATISTICS, 1901-1912,				CHICAGO, BURLINGTON & QUINCY.				
	Revenue Tons One Mile.	Per cent. Increase Over 1901.	Rev. Tons per Train Mile.	Per cent. Increase Over 1901.	Rev. Tons per Car.	Per cent. Increase Over 1901.	Revenue Fr. Train Miles.	Per cent. Decrease Below 1901.	Average Operated Mileage.
1901.	3,871,337,916	..	200.43	12.50	18,397,431	..	7,753		
1902.	3,970,277,901	2.5	220.52	10.0	13.02	4.2	16,944,726	7.9	7,941
1903.	4,873,589,690	26.0	271.24	35.3	14.77	18.2	16,784,943	8.9	8,305
1904.	5,101,521,081	31.6	284.16	41.8	15.49	23.9	16,647,377	9.5	8,323
1905.	5,188,952,589	34.4	332.28	65.5	15.73	25.8	14,198,894	22.8	8,553
1906.	6,303,883,569	62.8	370.38	84.8	16.53	32.2	15,742,307	14.5	8,608
1907.	7,114,843,286	83.5	394.06	96.1	17.55	40.5	16,773,037	8.9	8,863
1908.	6,604,633,576	70.4	384.26	91.5	17.54	40.5	15,975,838	13.2	8,977
1909.	6,620,646,367	70.9	387.44	93.0	17.08	36.6	15,823,841	14.2	9,023
1910.	7,435,144,216	91.7	381.26	89.8	16.99	35.9	18,595,294	*1.0	9,023
1911.	7,116,005,120	83.8	406.33	102.0	17.21	37.6	16,608,998	9.8	9,072
1912.	7,675,979,757	98.3	437.75	118.0	18.20	45.5	16,688,629	9.8	9,074

\*Increase

stock than any other road, handling 1,830,064 tons last year; and this traffic is not susceptible to heavy loading.

The heavy train load on the Burlington must, therefore, be explained very largely by other reasons and one must conclude that it is brought about rather by a definitely arranged system than by natural conditions. The means adopted to bring about these results are in the main, the reduction of grades and the development of high standards of maintenance, the use of heavier engines and cars, the development of a heavy long haul traffic, and, most important, the close, careful supervision of all the details governing train loading and operation.

Large expenditures have been made for the reduction of grades on certain lines handling heavy traffic, although this work has been thus far confined to a comparatively few lines. The most prominent instance of this work has been the reduction of the maximum grade from 1.2 per cent. to 0.3 per cent. from Centralia, Ill., to Savanna, a distance of 331 miles, in connection with an extension from Centralia south to Herrin in the southern Illinois coal fields, giving a continuous ruling grade of 0.3 per cent. from Herrin, Ill., to St. Paul, 625 miles. By this reduction of grades, combined with the use of heavier engines, which will be referred to later, the tonnage rating on this line has been increased from less than 800 tons to 3,800 tons.

Equally large expenditures have been made for additional main and side tracks to handle the increased business. The most prominent work of this nature is the construction of a second track south 300 miles from St. Paul, which has been in progress for the past four years, involving a very heavy expenditure in order to secure a line with a maximum curvature of one deg.

of these lines has been found to permit of increasing the train loading without any change in power. Other branches have been strengthened to allow the use of heavier engines. Many lines have thus been improved at relatively small cost, not with the purpose primarily of reducing the cost of maintenance but rather of securing greater train loads and decreasing the final cost of operation. The utilization of engine cinders may be cited as one example of the manner in which these branch lines have been improved with a relatively small expenditure. Up to about five years ago cinders were regarded as a source of expense and suitable only for filling material. At about this time a well defined programme was formulated for the utilization of these cinders as a ballast for branch lines. Since that time certain lines have been selected for improvement each year. The cinders are loaded in coal cars at the various terminals and the cars are routed over these branches on their return trip. The local freights unload a few cars each day, eliminating work train expense so that practically the only cost is that of putting the cinders under the track, for the cars would otherwise be returned to the mines empty. By this programme 1,144 miles of track were ballasted in the four years 1908-11, inclusive.

Coincident with the reduction of grades and the improvement of lines, important advances have also been made in the adoption of heavier motive power and new equipment of greater capacity. With the exception of a few consolidation locomotives with a tractive power of 38,000 lbs., the heaviest engines in use in 1901 were of the Prairie type with 20,000 lbs. tractive power. Since that time large additions have been made to the locomotive equipment, both in numbers and in power, and now the standard

locomotive for main line service is the mikado type with a tractive power of 60,000 lbs. However, although these mikado engines are very generally used on the main lines and some 100 are now in service, the large number of smaller locomotives on branch lines brings the average tractive power of all locomotives on the system down to about 28,000 lbs. This is, however, 40 per cent. above the *maximum* tractive power used 11 years ago. The average tractive power of the locomotives in the entire country for the year ending June 30, 1910, the last year for which the reports of the Interstate Commerce Commission are available, was 27,282 lbs. or about the same as it is now on the Burlington. The average train load in the country for the same year, however, was only 380 tons as compared with 438 tons for the Burlington. In other words, with practically the same average tractive power the train load on the Burlington exceeded that of the country at large by 15 per cent. The average train loads of the roads operating in Interstate Commerce Commission Groups VI and VII, in which the Burlington lines lie almost entirely, for the same year were 359 and 376 tons, respectively.

The distribution to the branch lines of the locomotives released from the main lines has been given as much attention as the purchase of new engines in order to place them where they would render the greatest service. On some branches with light traffic the smaller engines are capable of handling the business offered, and the use of heavier engines on these lines would not reduce the train mileage. On other lines the use of heavier locomotives has enabled the number of trains to be reduced by increasing the tonnage per train. By studies of this nature the power released from main lines has been placed on those lines where the greatest reduction in train mileage can be made, and this has had an important bearing upon the high average train loading. It is because of this that comparatively heavy locomotives are now found on numerous branch lines of the Burlington.

The condition and capacity of freight equipment has likewise been greatly improved and large numbers of new cars have been purchased. In 1905 the average age of all cars owned by the road was 22 years. This age has now been reduced to about 12 years by the destruction of many old cars and the purchase of new ones. In 1901 the Burlington owned 42,821 cars of an average capacity of 23 tons. In 1912 the number of cars owned had increased to 58,967 with an average capacity of 38 tons, while the total capacity had increased from 987,369 to 2,250,365 tons. In addition, a large number of new cars has been delivered since the compilation of these statistics. In view of the fact that the average car capacity has increased 66 per cent., it is instructive to note that in the same period the average car loading has only increased from 12.5 tons to 18.2, or 46 per cent. Considering the increase in car loading made in the country as a whole, this is a very creditable showing, but the figures illustrate the difficulty of securing co-operation from the shipper in increasing car loading equal to the effort the railway makes to increase its train loading. As shown on the curves the rate of increase of the car loading is less than that of revenue ton miles or train loading, and has been comparatively small for the last five years. In purchasing new equipment it has been the aim of the management to own as many cars as are required for the handling of business, and the success with which this has been done is indicated by the fact that there has been no well founded complaint of car shortage, even of coal cars, on its lines for several years.

An important factor in increasing the train loading has been a growth of 98.3 per cent. in the amount of business handled and especially in the long haul business. The alliance with the Great Northern and Northern Pacific has been instrumental in turning a large amount of traffic over to the Burlington at St. Paul and Billings, 15 per cent. of the total traffic of the road being secured from these connections at these points. As this is practically all long haul traffic its effect upon the totals is evident. Another important development responsible for a large increase in tonnage is that resulting from the construction of a

low grade line into the Southern Illinois coal fields in 1905. Although this line was built only eight years ago the traffic has developed to such an extent that a large portion of it is now double tracked. In this period, while all kinds of traffic has increased, the coal traffic has grown to form the largest single item of freight.

More important, however, than any influence enumerated above on the increase in train loading, is the influence of supervision. In this the example of the other Hill roads has been of assistance. While the Burlington is operated entirely separately from the Great Northern and Northern Pacific, there exist both friendly co-operation and friendly rivalry. Monthly comparisons of the reports of the three roads are prepared and sent to each road regularly so that each officer can see what his road is doing in comparison with the others and can profit by the experience of the others.

All officers from the executives down to the local division forces are trained to watch the train loading and car movements closely. Daily division tonnage sheets are closely studied and every effort is made to reduce light train movements. To this end the local way freights and time freights are filled out with dead freight as far as possible without interfering with their schedules. Turn around trains are freely employed to haul traffic over portions of divisions of heavy grades, these trains being then set out and used to fill out other trains to full tonnage over the lighter grade portions of the divisions.

One definite result of this close supervision is shown in the average miles moved per car per day, which is over 32 miles and has been as high as 35.6. This stands out in marked comparison with the average car mileage for the country, which is slightly above 24 and has never exceeded 26. Like the train loading, this car movement on the Burlington has steadily risen until it is now about 20 per cent. greater than it was eight years ago.

As an example of the means by which supervision is extended over the system, a daily telegraphic report is made of all cars held in yards over 24 hours, with the reasons for this delay. Any cars detained unnecessarily are thus detected at once and started moving. At the same time these reports also furnish a knowledge of the condition of all parts of the system so that measures can be at once taken to overcome any shortage of power or crews or any congestion in repair or classification yards.

A record of all time freight shipments is kept by cars in the office of the superintendent of transportation. A telegraphic report of all such cars in a train is made to the superintendent of transportation by each conductor on leaving a terminal and if such a car is set out for repairs or other reasons on the road, this office is again notified of the location and reason for setting out. Thus, each car of time freight is followed from terminal to terminal until it reaches its destination and can be definitely located either in a yard or in a train between two terminals at any time. While these reports are not necessarily original with this road, the care with which they are followed up is not general on other roads and accounts in a large measure for the increased car loading as well as the train tonnage. What is more important, this close check enables the road to give regular and prompt service, and there are less complaints from shippers of delays than there were before this system was inaugurated. The figures quoted before as to the average movement per car per day are perhaps in themselves a sufficient answer to any criticism that the increase in train tonnage has been followed by slower movement of the freight.

It will thus be seen that while the high figure of 438 revenue tons per train is undoubtedly due to a limited extent to the heavy proportion of traffic in products of mines, it is due to a much larger extent to a systematic study and development of all the various factors entering into increased train loading. The reduction of grades and the improvement of the condition of the track and structures, the use of larger engines and cars and the development of long haul freight traffic, have all been correlated under careful supervision for the common purpose of increasing the economy of operation.

## MORRIS McDONALD.

Morris McDonald, vice-president and general manager, was on July 9 elected president of the Maine Central, and on July 16 was elected also president of the Boston & Maine. Mr. McDonald's experience has been almost entirely in the operating department, although one of the first positions he held in railroad service was that of paymaster. Mr. McDonald has a heavy responsibility to take and a difficult problem on his hands. The Interstate Commerce Commission, in its report on the New England situation, found that the freight service on the Boston & Maine was very bad, while at the same time it commented particularly on the good service being rendered on the Maine Central. The Boston & Maine is by no means in all respects up to modern standards of railroad construction, and at present it would have particular difficulty in raising new capital for any extensive improvements. Furthermore, presumably the organization of the Boston & Maine, which was in general deeply loyal to Lucius Tuttle, could hardly have transferred its fealty to the Mellen management, particularly since this management acknowledges frankly that it is physically impossible for Mr. Mellen to devote as much time to the Boston & Maine and Maine Central as these properties are entitled to.

One prediction may be made with certainty: Mr. McDonald will not only know his general superintendents by sight, but will know personally all the men on the Boston & Maine whose duties will, under any ordinary circumstances, bring them in contact with the active head of the operating department of their road. Mr. McDonald is a hard worker and expects and obtains hard work from his subordinate officers. He is a man who interests himself in every detail of the work under his charge, and one not likely to stand on ceremony in dealing with officers even a number of grades removed from the president. Mr. McDonald has a reputation of being a thoroughly competent operating man, and that is one thing that the Boston & Maine undoubtedly needs badly.

Morris McDonald was born at New Albany, Ind., August 20, 1865. He had a grammar school education and began railroad work at 18 with the Kentucky & Indiana Bridge. On January 1, 1885, he was made paymaster of the Louisville, Evansville & St. Louis, now part of the Southern Railway. He later became assistant treasurer, and then switched to the operating department as chief clerk to the superintendent, and before the end of 1892 had served as trainmaster and as superintendent of transportation. At the beginning of 1893 he went to the Central of Georgia as chief clerk to the superintendent at Savannah, acting also as assistant trainmaster on the Savannah division. In December, 1896, he was made secretary to the general manager of the Maine Central, and a year later was made general superintendent. In January, 1908, he was made vice-president and general manager.



Morris McDonald.

## NEW ILLINOIS PUBLIC UTILITIES LAW.

The act passed by the last session of the Illinois legislature creating a public utilities commission to supersede the railroad and warehouse commission, goes into effect January 1, 1914. The governor is expected to appoint within a few days the five members of the commission. Of those appointed at the creation of the commission two are to serve until March 1, 1915, two until March 1, 1916, and the fifth until March 1, 1917. After the first commissioners appointed the terms are to be for six years each. The salary of each member is to be \$10,000 per annum; of the secretary \$5,000, and of the counsel \$6,000.

The law has been modeled closely after that of Wisconsin. Some of the principal features are as follows: Section 8 provides that the commission shall have general supervision of all public utilities; shall inquire into the management of their business and keep itself informed as to the manner and method in which the business is conducted. It is empowered to describe the manner in which the accounts of public utilities shall be kept, except where there is conflict with the requirements of the Interstate Commerce Commission. It is further prescribed that the accounts of public utility companies located in the state which are operated from headquarters outside the state shall be kept in an office within the state. The commission is given authority to regulate security issues, and when application is received for permission to issue securities the commission is required to hold hearings and an investigation. In applying for such authority the public utility must certify that the intended expenditure is not properly chargeable to income, and the commission may require it to disclose every interest of the directors in the transaction under investigation. Physical valuation of properties is provided for when deemed necessary by the commission.

The approval of the commission is to be required before consolidation of two or more public utilities may go into effect, and the capitalization of the consolidated company may not be more than the combined capitals of the separate corporations, plus any sum actually paid in cash for improvements. Contracts for consolidation shall not be eligible for capitalization. Contracts to operate lines jointly, acquire leases, franchises and plants, or to acquire stocks or securities of other public utilities are prohibited unless consent of the commission has been first obtained.

The provisions regarding rate regulation are similar to those in most of the recent laws of this kind, requiring the publication and filing of tariffs, and providing that rates shall not exceed those in force on July 1, 1913, except by consent of the commission. The commission is empowered to suspend new rates for 120 days, and for a further period of six months. Certificates of convenience and necessity are to be required for any new construction or extension work, and broad powers are given to the commission to compel adequate service. The

commission is given power to issue orders directing railway companies to increase the number of trains or of cars or motive power, to change time schedules and stopping places, or to make such orders as may be reasonably necessary to accommodate and transport the traffic offered.

### A BALTIMORE & OHIO ANNIVERSARY CELEBRATION AT WHEELING.

During the semi-centennial celebration at Wheeling, June 15-21, of the admission of West Virginia to the Union as a state, the Baltimore & Ohio commemorated the sixtieth anniversary of the completion of the road to the Ohio river. A number of old locomotives which ran on the road 60 years ago were taken out of their resting places and exhibited at Wheeling, under steam, and they were run by veteran engineers now retired, who returned to active service for this occasion. Sixteen men took part in the celebration and the years of their service aggregated 775. Their names and records are as follows:

Michael Kirby, engineer, 58 years (struck blow on gold spike marking completion of Baltimore & Ohio to Wheeling, December 24, 1852); Abner T. Ingels, engineer, 53 years; Joseph J. Brady, conductor, 50 years; Ephraim Provance, engineer, 43 years; Robert Hutchinson, engineer, 50 years; Henry C. Elder, conductor, 50 years; William Fleming, brakeman, 45 years; "Daddy" John Smith, brakeman, 58 years (transferred car of President Lincoln through Baltimore on way to first inauguration, also the funeral car containing the remains of the martyred president on the way to Springfield for burial); John Seibert, Cumberland Valley Railroad, engineer, 46 years; W. O. Peach, shop foreman, 45 years; George Sturmer, general manager's office; Michael Dee, conductor, 50 years; J. H. Fosnot, brakeman and conductor, 50 years; James Mahoney, brakeman, 39 years; J. E. Spurrier, assistant to general manager, 51 years, one of the oldest railroad officers in America in active service; Z. T. Brantner, superintendent of shops, 51 years.

With the single exception of the horse-drawn car of 1830, every example shown was an original. The realism was further heightened by the movement under steam. The old engines were moved by their own power in the old Hempfield yard, where they remained during the week, and on one of the days all were marshaled in a parade, presenting a spectacle the like of which may never be witnessed again.

Old types of locomotives that in their day marked progress in railroad development as suggestively as the Mallet, Mikado and Pacific do in these times, once more came to life and were living, breathing things. Stacks that had not vomited smoke, and fireboxes and boilers that had remained cold from a quarter to half a century showed that they could "come back." The comparison of these little engines with those of the Mallet type was of course most striking.

The old Hempfield yard has eight tracks abutting on the street. It is a square in the very heart of the city, into which came the Baltimore & Ohio years ago. It contributed a huge level stage and upon it flocked thousands of spectators. The old horse-car headed the pageant. It was drawn by a gray horse, its driver perched high in front, with one foot on the bar for controlling the car, as in the stage coach of the period.

Then came the "Atlantic" of 1832, the oldest locomotive on the continent in its original form. This is one of the grasshopper type, with upright boiler.

Next in line was the "Thomas Jefferson" of 1834, of the same type as the "Atlantic," but with a cab. This engine was in service 40 years. To it was attached an old four-wheel passenger coach of 1838. This coach is in the form of a road stage coach in vogue about 70 years ago, its rounded body and two crosswise seats facing each other, with a carrying capacity of six or eight persons. Next came the "Mississippi"

of 1837, the first locomotive seen west of the Mississippi river. The Cumberland Valley "Pioneer," the Seth Wilmarth type of 1847, followed, drawing an old combined passenger and baggage coach of 1855. The "Pioneer" in 1860 ran from Harrisburg to Chambersburg in 68 minutes, including two stops for wood and water, averaging very close to a mile a minute.

The Chicago & North Western "Pioneer" of 1848 came next, the first locomotive seen in Chicago. Then came the "Dragon" of 1848, and the "Camel" of 1850. Many of the old railroaders of West Virginia still remember seeing the Camel class of engines in active service.

Bringing up the rear was the monster modern Mallet locomotive which in full working order, with tender, weighs 43 times as much as the grasshopper "Atlantic."

Major J. G. Pangborn, the well known veteran historian of the Baltimore & Ohio, had charge of the arrangements for this railroad celebration. Major Pangborn was director of the Baltimore & Ohio's remarkable historical collection at the Chicago and the St. Louis world's fairs, and these old engines were described in the book which he published in 1893.

The Baltimore & Ohio is rich with history at every turn. Senator Henry G. Davis, of West Virginia, whose birth antedates the time when a railroad was first known on this continent, was for many years in the service as brakeman and conductor. J. E. Spurrier, referred to above, was formerly a superintendent, and farther back, about 40 years ago, ran an engine. Like General Manager C. W. Galloway, Mr. Spurrier is of the third generation in the service. The grandfathers of both of these men drove horses attached to cars over the line in 1830 before the days of the locomotive. Mr. Galloway's grandfather piloted the first regular passenger car, which was little more than a clapboard cabin on four wheels holding a half dozen passengers sitting on board seats running lengthwise and each of whom was way-billed the same as freight is nowadays. The driver was perched up on a seat outside the front end and it was the elder Galloway with his celebrated gray horse, who in the historic race with Peter Cooper's experimental locomotive in August, 1830, carried off the honors.

### THE DECISION OF THE SUPREME COURT AS TO RAILWAY LAND VALUATIONS.

The following appeared as an editorial in a recent issue of *Engineering and Contracting*, the editor of which is H. P. Gillette, who was engineer of the Washington Railroad Commission at the time the valuation was made in that state.

The recent decision of the United States Supreme Court in the Minnesota rate case exemplified the old adage that a little learning is a dangerous thing. The court has made a momentous ruling as to the valuation of railway right of way, basing its ruling upon evidence that was insufficient, for it is inconceivable that the evidence was sufficient when we read such sentences as this in the court's decision:

It is impossible to assume in making a judicial finding of what it would cost to acquire the property (land) that the company would be compelled to pay more than its fair market value.

If it is judicially impossible so to do, then we have the incongruity of a court's refusing to recognize facts of every day occurrence, for not a week passes that some railway company does not pay more than the "fair market value" for land taken for right of way purposes. By "fair market value" is here meant the value of land for other purposes than railway right of way.

In the Minnesota rate case both the railways and the engineer of the Minnesota commission used "multipliers" or "public utility factors" by which to multiply the "market value" of land to determine its "right of way value." Hence the railways could not have anticipated that the Supreme Court would have seriously questioned the propriety of the use of such "multipliers" or "factors." Moreover, the engineers and the railway commissions of Michigan, Wisconsin and Washington had all used

"factors" of this sort in appraising railway right of way. This concurrence of practice arose not from following some precedent, but from independent investigations that disclosed in each state the actual existence of an excess of right of way costs over the market value of the land for farming and other purposes. If such facts had been fully presented to the Supreme Court it is hardly credible that it would have said:

The increase sought for "railway value" in these cases is an increment over all outlays of the carrier and over the value of similar land in the vicinity. It is an increment which cannot be referred to any known criterion but must rest on a mere expression of judgment which finds no proper test or standard in the transactions of the business world.

This is not true. There is a "known criterion" in almost every purchase of land for railway right of way.

The Supreme Court rules that the present value of land, and not its actual or original cost, is to be used in an appraisal for rate making. This is a very important ruling for there have been some who have contended that a railway is not entitled to the "unearned increment" in land value. The court says on this point:

It is clear that in ascertaining the present value we are not limited to the consideration of the amount of actual investment. . . . The property (land) is held in private ownership and it is that property and not the original cost of it, of which the owner may not be deprived without due process of law.

The court holds that a railway is entitled to increments in the value of its land, i. e., to share in the general prosperity of the community it serves, but the court apparently thinks that the use of any "multiplier" or "public utility factor" for right of way results in giving a railway more than its share of increment in land value. Yet a simple arithmetical calculation upsets this conclusion. Suppose farm land worth \$50 an acre 20 years ago is now worth \$100. Suppose a railway built 20 years ago paid \$150 an acre for right of way through this land—a not uncommon "multiplier" being three. Then the farm land worth \$100 today has enhanced in value 100 per cent. in 20 years. In order to secure an equal percentage of increment in the value of the railway right of way, it must be valued at \$300 an acre, or a "multiplier" of three must be applied to the \$100 value. If no "multiplier" at all is applied, we have this illogical and unfair result: Land that cost the railway \$150 an acre 20 years ago is today appraised at \$100!

The Supreme Court not only rejects the use of "multipliers" but it also rejects all overhead expenses—engineering, interest during construction, etc.—relating to the land. This ruling as to overhead charges on land is even more astonishing than the rejections of land "multipliers." With equal justice might overhead charges on all other railway property be cut out in making an estimate of the cost of reproduction.

It is quite clear, we think, that the Supreme Court made such errors as these, largely because incomplete evidence was presented by the railways. Up to the present time no steam railway, as far as we know, has presented its case properly and fully to the Supreme Court. In the Minnesota rate case the railways did not even present evidence to show the amount of their "development cost," "going value" as the Wisconsin Railroad Commission calls it. This was a serious—a very serious omission, for "development cost" is usually more than sufficient to wipe out accrued depreciation. When the steam railways awoke to the realization that appraisal problems are complex problems—not mere inventories of visible objects—they will probably seek the advice of appraisal experts. They will learn that consulting engineers can give advice of greater worth than they usually receive from attorneys employed for consultation, for a rate case is about nine-tenths engineering—engineering of a very complex and special character—and one-tenth law.

**PROPOSED LINE FOR INDIA.**—A survey is being carried out by the Maharajah of Benares for a 2 ft. 5 in. gage line about 31 miles long between Moghul Serai and Ahaura via Baburi, Chakia and Shikargarh.

## RAILWAY PUBLICITY DEPARTMENTS.\*

By J. HAMPTON BAUMGARTNER,  
Publicity Representative, Baltimore & Ohio.

I think that each editor at this meeting will agree with me that within the last few years there has been a marked change in business—the ethical standard of business has been elevated. Efforts are constantly being made to meet the wishes of the people upon the basis of fairness in business transactions. The attitude which formerly prevailed in some quarters, the so-called "public be damned" policy, has been changed, and today can very properly be paraphrased "public be served."

The wave of agitation which swept over the country some years ago and crystallized into antagonism toward business, was felt keenly by the railroads; and in meeting the situation they moved to get in closer touch with the public. Departments of public relations were established by some of the roads, as well as by many of the industrial and manufacturing concerns and public service corporations. Many of the railroads and the other interests I have mentioned established departments of publicity, which handle largely matters of public relations, and with the co-operation of the press, endeavor to effect a fair understanding between the business interest on the one side, the editor and the public on the other.

Before speaking more in detail of the working of the publicity department of a railroad, I wish to make a statement that an erroneous impression prevails in some quarters that the publicity departments were organized for the purpose of conducting campaigns of cheap publicity and thus obtaining a considerable amount of free advertising.

This was not at all the purpose of the railroads. A railroad regards its publicity department as the mouthpiece of the management and the point of contact with the public, largely through the co-operation of the press. The publicity department is connected with the executive offices. Trained men are in charge, and their relations with the editors and others connected with the press are transacted in a dignified manner and with a view to inspiring confidence in and dependence on the statements which they make to the press concerning the interests represented. So far as the matter of advertising is concerned, I speak with authority when I state that, on the contrary, every publicity man would be glad to see substantial increases made in advertising appropriations.

As to the character of matter which is sent to the press by the railroad publicity departments, I think it can generally be said that the articles are confined to legitimate news, such as improvements to the property or service in different sections, purchase of new equipment, news of industrial development or progressive policies of the management in co-operating with a state, city or business organization for the advancement of any condition or interest. Announcements are made also as to changes in officials and other matter which is regarded as of interest to newspaper readers living in communities reached by the various railroad lines.

This matter is sent to the editors when it is fresh news. When conditions arise which require it, the information is sent by telegraph to the newspaper office.

The publicity department aims to have the editors understand that information can always be obtained concerning the railroad company, and an agent will gladly telegraph an inquiry which comes to him from his local editor. The information thus received in the newspaper office, in response to such inquiry, is authoritative. Special information and articles are also sent in response to requests.

Another change which the publicity department has brought about in the relations between the press and the company, is in the furnishing of information concerning railroad accidents.

\*From an address before the Virginia Press Association at Mount Elliott Springs, Va., on June 26, 1913.

# LIFE OF LOCOMOTIVE FIREBOXES.

Outwardly Inclined Water Leg is Best—Direction of Rolling Sheet Important—Single Piece Firebox a Mistake.

By C. T. ROMMEL.

Considerable discussion on this subject originated with the very able paper read before the Western Railway Club several years ago by C. A. Seley, then mechanical engineer of the Rock Island Lines. It was generally agreed that the present type of wide firebox had a much shorter life than the older and more narrow type, although the material used in their construction was practically the same. Many reasons were assigned for this. Higher steam pressures are used on the boilers with the wide fireboxes than on those with the narrow ones. There is more abuse of the boilers at terminals by the hostlers and less care is taken in washing out, on account of being in a greater hurry for the power; last, but not least, is the effect of the design of the firebox.

The most important point brought out by Mr. Seley was that the design of the firebox had a very great effect on the water circulation. He said, "that the rate of flow and its wiping effect or scrubbing action can be directed against the side sheets so it has

known as the one-piece firebox; that is, the crown and side sheets are made in one piece. To this particular feature more attention will be given later on.

To get back to the point brought out by Mr. Seley, the actual results obtained in service will be interesting. In Fig. 1 are shown the outlines of the water legs of the different types of fireboxes.

Outline *A* in Fig. 1 represents five locomotives with a three-piece firebox, 5/16-in. side sheets, and a boiler pressure of 190 lbs. These had been in service 95 months. No side sheets had been renewed at the time the investigation was made. The probable life of the side sheets appeared to be 110 months.

Outline *B* represents 210 locomotives with the fireboxes in one piece, 3/8-in. side sheets, and a boiler pressure of 205 lbs. They had been in service 36 months. The average life of the firebox was 34 months.

Outline *C* represents 197 locomotives with the fireboxes in

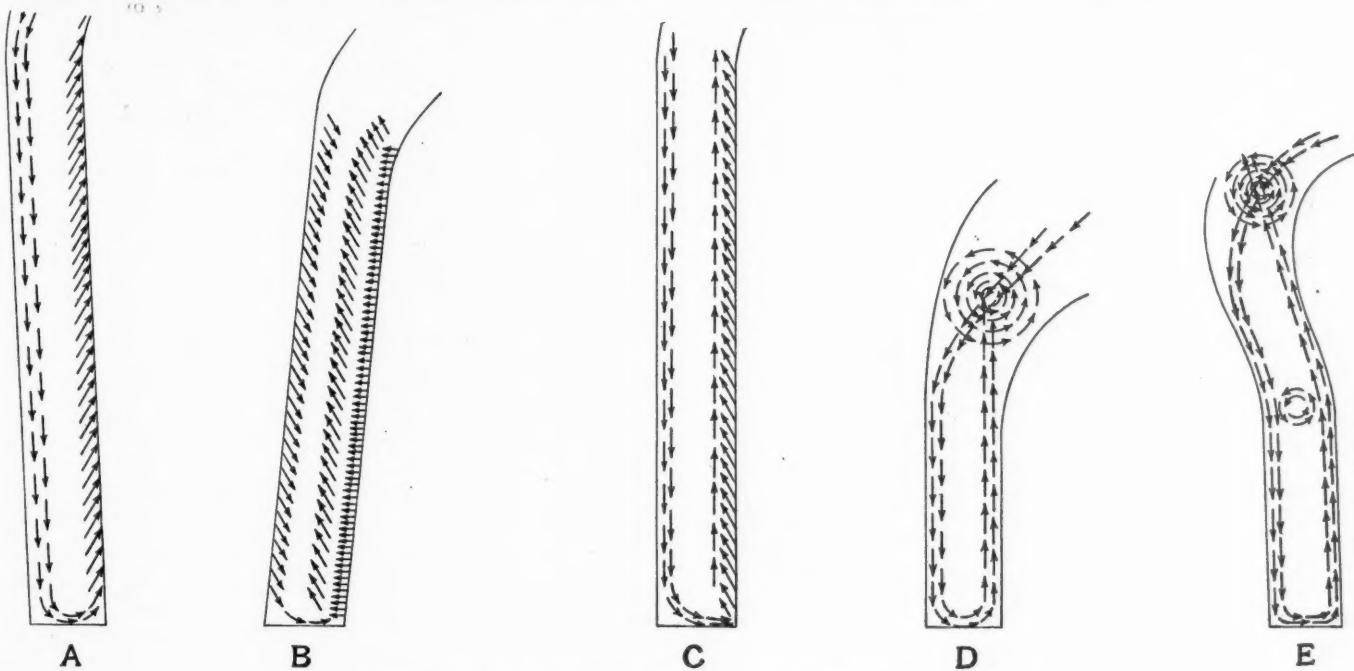


Fig. 1—Direction of Circulation as Found in Experimental Tubes.

the effect of wiping off the steam bubbles as they form, preventing their combining into a film or curtain of steam against the sheet which is by no means as good a conductor of heat as is the solid water. This theory will account for increased internal temperature of vertical and inwardly inclined side sheets and can be inferentially proven."

Mr. Seley said that the theory could be inferentially proven. It shall be the endeavor of the writer to show that the theory can be obviously proven and the lapse of time between the reading of Mr. Seley's paper and the preparation of this article has been spent in investigating the subject along the lines suggested by Mr. Seley.

At this point it will not be amiss to state that beyond question the form of construction of the firebox and the material used also enters largely into the shorter life of the wide fireboxes. Every railroad man familiar with the mechanical department is aware of the trouble caused by the seams joining the side and crown sheets when the side sheets are separate from the crown sheet, and to overcome this trouble change was made to what is

three pieces, 5/16-in. side sheets, and a boiler pressure of 205 lbs. They had been in service 72 months. The average life of the firebox was 56 months.

Outline *D* represents 143 locomotives with three-piece fireboxes, 5/16-in. side sheets and a boiler pressure of 200 lbs. They had been in service 98 months. The average life of the firebox was 64 months. (The locomotives in this group have the Wooten type firebox.)

From this it will be seen that the results obtained in actual service show the design of firebox with the greatest inward slope and the firebox in one piece had an average life of but 34 months, while the designs with the lesser amount of inward slope and made in three pieces, had a correspondingly greater life. The longest life obtained was on the type with the outward slope, next the type shown by outline *D* (Wooten type, practically vertical); third, the type shown by outline *C*.

These results, obtained in actual service, substantiate Mr. Seley's theory, but not being satisfied with this and desiring to know just what the circulation of water would be with the dif-

ferent types, an interesting experiment was made. Glass test tubes,  $\frac{1}{8}$  in. in diameter, were bent to the form of the water legs of the different designs and connected to a filter tube with a side outlet, this outlet being provided for the purpose of allowing the steam to escape; in other words, it acted as a safety valve. The filter tube was filled with water to such a height that there would be approximately the same amount of water as there would be on the top of the crown sheet. Heat was applied by means of one or more Bunsen burners in order to get as near the actual conditions as possible, and as the steam bubbles formed the circulation of the water was observed, the steam formed escaping through the safety valves. The apparatus used is shown in Fig. 2 and the results obtained are indicated by the arrows on Fig. 1.

Of course, there will be those of doubting mind who will say that the results obtained do not represent truly the circulation of the water in the firebox legs, as there was no connection with what would represent the barrel of the boiler; while this may be true, all must admit that the apparatus used represents beyond question an element of the boiler, and while the circulation found may have been more free than that obtained in actual practice, it most certainly represents the direction of the circulation.

From Fig. 1 it will be noted that with the outwardly inclined water leg the direction of circulation as indicated by the arrow heads was towards the inner, or fire side, washing off the steam bubbles as they formed, and downward on the outer side. With the inwardly inclined leg, the circulation was away from the inner side, while the tendency on the outer side was toward the inner at an angle of about 45 degrees; as a consequence the circulation was very much retarded and the steam bubbles which formed on the inner side remained stationary until sufficient pressure was obtained to drive them away; when these bubbles left the inner side of the tube they had a tendency to drive the water with them. Conditions such as these in actual practice would beyond doubt result in abnormally high temperatures of the side sheets. It was also noted with the inwardly inclined tube that it was very easy to make the water boil over, or foam, while with the outwardly inclined tube it was impossible to obtain this condition.

With the straight tube the steam bubbles formed on the inner side and left the tube at an angle of about 35 degrees, being carried upward by the circulating water, the current of which was but a very short distance from the inner side of the tube. The water ran parallel with the outer side of the tube. There was no washing effect obtained with this tube as with the outwardly inclined tube.

With the tube representing the Wooten type of boiler (D, Fig. 1) the circulation was parallel with both the inner and outer sides until the diverging point was reached; at this point the two currents appeared to cross each other, the result of which was a very noticeable whirlpool. As the steam bubbles were formed they were carried upward by the circulation, the water and steam mingling. At all times the inner side of the tube seemed to be well covered with water. It was also easy to cause the water to boil over with this type of tube.

With the O G type of tube (E, Fig. 1) the circulation was also parallel with the inner and outer sides until the upward curve was reached; at this point the currents crossed each other and caused a whirlpool similar to that obtained in the Wooten type. A smaller whirlpool was also noticed at the lower curve with a tendency to retard the circulation at this point. It is about this point that considerable trouble is experienced with cracked side sheets with this type of firebox and this may be the cause.

By accident an incident occurred during these experiments that should convince the most skeptical. One of those looking on while the experiments were being made unfortunately could not see as well as the others, owing to his eyesight being somewhat defective, and in order that he might see what was taking place, silica was added to the water in the tubes, so that when the circulation started the silica followed the currents being formed,

and their direction could be more readily seen. This silica is precisely the same as the mud and scale forming elements in the water fed to locomotive boilers. When the water in the tubes was allowed to cool, the silica naturally precipitated in the same manner as the mud and scale forming elements would in the boiler. This precipitate clung to the tubes at exactly the same points that have been found worst for collecting mud and scale on the different shapes of water legs on locomotive boilers in actual service.

These experiments appeared to establish the soundness of Mr. Soley's theory and it seems that the best circulation is obtained with the outwardly inclined water leg. Several of the larger railroads have adopted this design during the past few years and to the best of the writer's knowledge the results obtained have been very gratifying.

#### MATERIAL.

Ordinarily, whenever trouble develops with any part of the boiler, unless the cause is very evident, the first reason assigned for it by those directly in charge is poor material or weak design, and it is up to those responsible for the material and design to get busy. For a long time the steel used in fireboxes has been either basic or acid open hearth, with a tensile strength of from 48,000 to 65,000 lbs. per sq. in., the carbon running from

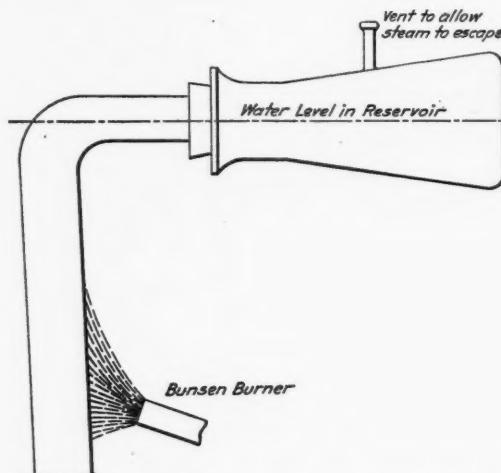


Fig. 2—Arrangement of Apparatus for Studying Circulation.

.10 per cent. to .25 per cent.; the amount of carbon is directly proportional to the tensile strength, and this grade of steel has been used in both the wide and narrow fireboxes.

It is generally agreed that the milder the steel, the better will it resist the strains imposed upon it in service. One manufacturer recommends that the tensile strength be decreased and the thickness increased proportionally so as to obtain the desired factor of safety. Of course, this is not feasible, as tests made, with which all are familiar, show that as temperature increases, strength decreases, and increasing the thickness of the side sheets will beyond doubt result in higher temperatures. It has been found from actual service results that on the majority of the railroads experiencing trouble with short life of side sheets with wide fireboxes, the trouble has been confined to a great extent to the fireboxes made in one piece, and along this line the investigation was made.

It has been previously noted that the average life of the one-piece firebox in a group of 210 engines was but 34 months. In addition to the one-piece firebox, the water leg was inwardly inclined with the result of poor circulation. On fireboxes of this type the sheets fail in a longitudinal direction, extending as high as 30 in. above the mud ring, and usually about midway between the back tube sheet and the door sheet; no horizontal cracks have ever been reported or observed.

A single sheet that will be large enough for the two sides and the crown of one of our modern locomotives must be rolled at least 192 in. x 112 in. x  $\frac{3}{8}$  in., and as our largest rolls (at the

time this investigation was made) are but 144 in. wide, the sheet must necessarily be rolled so that the longitudinal direction of rolling will be placed in the firebox transversely; the transverse direction of the rolling will naturally be in a longitudinal position.

The greatest tendency of movement of the firebox, due to expansion and contraction, is fore and aft, and with this large sheet applied to the firebox as previously stated, the greatest strains are thrown against the longitudinal direction of rolling, rather than against the transverse direction of rolling. The effect of this is simply to open the grain of the steel. This sounds rather radical, but in order to determine whether the direction of rolling had any effect on the strength to resist a vibratory movement, the following tests were made. Also, the cause for all cracks appearing in a longitudinal direction will be made apparent.

Pieces of acid, basic and nickel open hearth firebox steel were

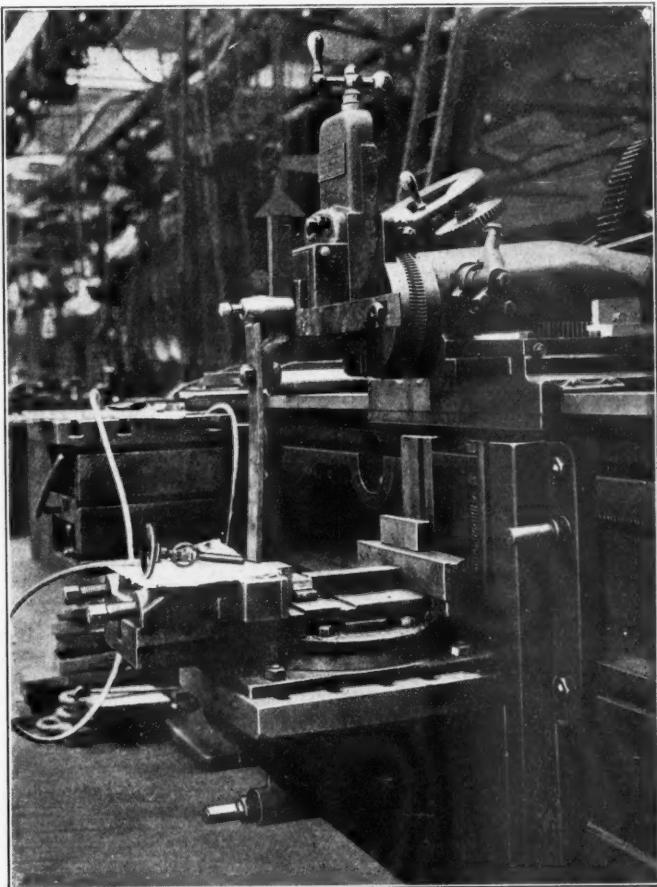


Fig. 3—Shaper Arranged for Vibrating Test of Firebox Steel.

clamped in the vise of an ordinary shaper. The opposite ends of these pieces were clamped rigidly to the head of the shaper. The distance from the head to the vise was 14 in. and the movement of the head on either side of the center line was 11/32 in. The machine was run at the rate of 37 strokes per minute. Test pieces were held constant, as near as possible, to a temperature of 300 degrees F. by means of a Bunsen burner. One longitudinal and one transverse test piece from each kind of steel was used in the experiment. The arrangement is shown in Fig. 3.

The analyses of the different steels were as follows:

	Carbon.	Mang.	Phos.	Sul.	Nickel.
Basic	.17	.46	.016	.029	
Acid	.10	.31	.027	.029	
Nickel	.37				3.30

Number of vibrations before fracture:

	Transverse.	Longitudinal.
Basic	6,351	3,494
Acid	8,539	7,350
Nickel	15,344	12,000

From these results it will be seen that the direction of rolling

has a very decided effect on the steel as far as the strength to resist vibratory stresses is concerned; also that the nickel steel will resist a greater number of vibrations than the acid steel, while the acid steel is superior to the basic.

It has often been remarked that at times the side sheet of a locomotive boiler cracks with a report like that of a pistol; during these tests a condition was observed that will explain this. There would be no signs of a fracture on the test piece in the machine and at the next movement the piece would break with a report, not as loud, of course, as a pistol, but plainly audible. The theory for this is that the steel is able to withstand so many vibrations, and after this number has been reached it is so fatigued that it fractures suddenly with the resulting report.

Another trouble in rolling a plate of this size is that there is a much greater tendency towards variations in thickness due to the springing of the rolls. Careful measurements of a plate cracked in service showed a variation in thickness of .073 in.

A further objection to this large plate is that there is a greater tendency for variation in the carbon content and more likelihood of segregation. Chas. L. Huston in his very interesting paper before the American Society for Testing Materials in 1906 (Proceedings of the American Society for Testing Materials, Vol. 6, 1906), showed clearly the results of this variation in carbon. It was graphically shown that in an ingot such as would be required to roll a plate of the size required for one of our modern locomotives, the carbon content at the bottom of the ingot and at either edge was about .13 per cent. with a tensile strength of about 55,000 lbs., while in the center of the ingot the carbon was .18 per cent. with a tensile strength of 58,500 lbs. At the top of the ingot the carbon content at the outer edge was .14 per cent. with a tensile strength of 56,000 lbs., while in the center at the top the carbon was .22 per cent. with a tensile strength of 65,000 lbs. There was a variation in carbon of .09 per cent. and in tensile strength of 10,000 lbs.; a like condition would be obtained in the plate rolled from the ingot.

As test pieces are taken from the edges of the plate and drillings for analysis are taken from the test pieces, while the carbon content and tensile strength of these test pieces would meet specification requirements, the center of the plate would have such a carbon content and tensile strength as to cause rejection; therefore, it appears that tests made on the firebox steel in order to insure that the results show what is actually being obtained, are open to question. As the specifications used by the railroad show a minimum and maximum tensile strength and carbon content, it would be better to ask only for a minimum specification limit, as it has already been brought out that the test pieces are obtained from the edges of the plate, and it has also been shown that the center of the plate will not contain any less amount of carbon, nor any lower tensile strength. As the factors of safety used in connection with the firebox construction are figured with the minimum tensile strength, there will be no danger of reducing the factor of safety used in the design of the boiler. The writer firmly believes that in following this course much better results will be obtained in service.

Since the advent of the oxy-acetylene and electrical methods of welding, which have now passed the experimental stage, it is no longer necessary to make firebox plates in one piece to eliminate the troublesome seam at the junction of the sides and the crown. The side sheets can be ordered rolled so that they can be applied to the firebox with the longitudinal direction of rolling placed longitudinally. They can be made 5/16 in. thick, which will insure a lower temperature, and welded to a 3/8-in. crown sheet. Tests made of welds by these processes show a strength of the original plate of 80 per cent. This is an increase of 15 per cent. over the best design of riveted seam at this point.

The question of staying has not been entered into, as a poorly designed method of staying will affect the life of the firebox, whether it be wide or narrow.

Summing up, it has been shown:

1. That the outwardly inclined water leg is the most desirable as far as the circulation of the water is concerned.

2. That the direction of rolling of the sheet affects its ability to withstand the strains imposed in service and that the direction of rolling should be specified.
3. That the relative values of the different steels to withstand these strains are, first, nickel; second, acid; third, basic.
4. That the lowest specification carbon content and tensile strength requirement should be asked for and accepted.
5. That the single piece firebox as now applied is a mistake.

### REPORT ON STAMFORD COLLISION.

The Interstate Commerce Commission has issued a report by Commissioner McChord, dated July 7, on the rear collision of passenger trains which occurred on the New York, New Haven & Hartford at Stamford, Conn., June 12. The name of Mr. Belnap, inspector of the commission, appears at the head of the report as one of the advocates who appeared before the commissioner. The railroad company was represented by Benjamin I. Spock and J. F. Berry, counsel, and C. L. Bardo, general manager, and C. N. Woodward, general superintendent.

This report fills 23 pages. The facts of the accident have been given in the *Railway Age Gazette* (June 20, pages 1532, 1548 and 1549; June 27, pages 1594 and 1608) and we take from the present report only such parts of the statements of facts as will throw additional light on the cause of the collision.

The rear car of the standing train was 171 ft. west of the home signal; the distant signal was 1,800 ft. in the rear of the home, and could be seen plainly by enginemen approaching from the east a distance of 1,847 ft. Between the home and the distant there is a two-degree curve and the home signal is not visible from the distant. The grade is descending for more than a mile approaching the distant signal, maximum descent one-third of 1 per cent. Doherty testified that he shut off steam on the curve before coming within sight of the distant signal; that he made a 15 lb. reduction of air pressure 300 ft. before reaching the distant signal and, as the brakes did not seem to take hold well, that he made another reduction of 10 lbs. after passing the distant signal; that emergency application was made when within 300 ft. of the standing train.

Doherty had fired three years in passenger service, mostly on a local passenger train on the single track line between New Haven and Shelburne Falls. When he was first a candidate for promotion he failed to pass the mechanical examination, but afterwards was again examined and passed. Prior to the collision he had worked altogether 265 days as engineman; in yard service 158 days; slow freight 79 days; fast freight 10 days; passenger trains 18 days, including the two days on train No. 53.

On reporting the brakes as unsatisfactory, two days before the collision, he noticed that the man in the roundhouse had not improved things and, being not entirely satisfied, he, on the return trip to New Haven, took extra precautions in making the stops, beginning to apply brakes "way back," and securing good results. He had much difficulty in watching the water, the water glass being out of order.

Since he had been an engineman none of the traveling engineers, who were employed for that purpose, had ever ridden on an engine with him, or given him any instructions or assistance of any kind. When he was taking his engine from the turntable preparatory to starting on the first trip to Stamford on Tuesday, June 10, Traveling Engineer Carroll asked him where he was going. He replied that he was going on second No. 53. Engineman Doherty's further testimony as to this conversation was as follows:

He said, "Well, for Christ's sake look out for yourself." He says, "Harmon got into it yesterday." He says that "the brakes ain't holding, and the water glass is out of order." Now he says, "Bardo is raising holy hell." So he says, "Start braking back far enough so as to make sure you will stop." That was the only instructions I ever got.

Doherty said he did not know at what point in Stamford

it was customary to change engines; but he had served three weeks as assistant to the engineman on electric locomotives between Stamford and New York, and during this time engines had been changed sometimes at Stamford station and sometimes at a point east of the station (as was the case on the day of the collision).

Fireman Smith, who was on the engine with Doherty on the day of the collision, was an extra fireman with about fifteen months' experience. His testimony is of little or no value.

Engineman Waite, who happened to be standing on the ground nearby at the time of the collision, examined the brake cylinders, and found one car on which the brakes were not applied; but he said that the air might have leaked out after the collision.

General Air Brake Inspector Joy was on the scene of the accident twenty minutes after it occurred. Judging by the time that the brakes continued on, he thought that they possessed good holding power. The breaking of the coupling, causing the separation of the train ahead of the Pullman car Centredale, he thought due to the emergency application of the brakes on that car while running at low speed.

The cars of Doherty's train came through from Boston over the Boston & Albany. The engineman of the train on that road, Boston to Springfield, 98 miles, said that the brakes were a little slow in operating, and that he had to make a large reduction of air before he felt the brakes take hold. The engineman who ran the train from Springfield to New Haven, 62 miles, said that the brakes were in good condition and that he had no difficulty in operating them.

Machinist Gash, inspector of locomotives at Stamford, has been a machinist for five years and has been at Stamford 10 months. When he found nothing wrong with the brakes he thought the defects noted by the engineman could not have been very serious, for, said he, if it had been serious the engineman would have told him about it. He did not remember the item in Doherty's report referring to the water glass.

At New Haven, the other end of Doherty's run, there is no book for reporting defects of engines; an engineman having anything to report must speak to the inspector. The report describes the practice of the inspectors as to examining engines and keeping records, both at New Haven and at Cedar Hill, just east of New Haven, where some of the engines are kept. Men making repairs are found to have been careless about properly recording in the books the facts concerning their work, as required by the rule. At the Cedar Hill roundhouse the record of work done was inadequate and the officers of the road had no means of knowing with precision the conditions of engines going out.

Road Foreman of Engines Carroll has held that position since August, 1912. Four road foremen of engines have supervision over about 400 enginemen. His testimony concerning his relations to Doherty agrees with what has been printed heretofore. Asked why he did not ride with Doherty on Thursday, in view of the fact that he had found it necessary to caution him, he replied that he believed he had already performed a day's work. (This was about 3 or 4 o'clock in the afternoon.) As to this the report says:

"In view of the importance of this train and in view of the fact that Carroll knew Doherty had had little experience as an engineman in fast passenger-train service, was not accustomed to the new engines, and had failed to control his train properly at one place on a trip just two days before, and also since he did not know whether or not a road foreman of engines had ever ridden over the road with Doherty, a proper sense of responsibility of his position and a proper regard for the safe operation of this train should have impelled Carroll to accompany Doherty on this trip."

The report here gives an account of the air brake tests on June 17. Seven running tests were made. In the first six the brakes were applied (service application) at a point 1,571 ft. in

the rear of the distant signal. In the sixth test the brakes were applied in emergency at the distant signal, the test being intended to reproduce the conditions under which Doherty said he had operated on the date of the collision (though the statement of Doherty's testimony indicates that he did not claim to have applied the brakes in emergency until within 300 ft. of the standing train). However, the train in all of the six tests stopped a good distance short of the home signal; but the seventh test, in which the brakes were not applied at all until the engine passed under the distant signal (at 59.6 miles an hour) the train was not stopped until it had run 496 ft. past the home signal and 325 ft. beyond the point where the collision occurred. A 10 lb. reduction was at first made; then a 5 lb. reduction and then an emergency application. The intervals of time between these different applications is not given. This seventh test was intended to reproduce the operations which the investigators supposed had been employed by Doherty on the day of the collision.

Prior to the test of the brakes the examination of the apparatus in the yard showed that piston travel was not uniform, and that on one car it was necessary to make a reduction of 20 lbs. to set the brake and on another it required between 30 and 40 lbs. This, says the report, indicated that the brake on this car would not apply except with an emergency application; and it is held that the break-in-two was probably caused by the brake on this car being set with full force by the emergency application; and it is also held that previous to that emergency application this brake probably did not hold at all.\*

The brake test made by cutting the train in two while running at high speed showed that the engine brake was very good; that is to say, the engine did not run much farther than the rear portion before stopping. The car brakes were not as good as they should have been; that is to say, with a train in first class condition there would have been a greater gap between the engine and the train after the stop.

The commission criticises the report of the air brake committee as lacking definiteness. The committee says that the brakes were in "good serviceable condition" but does not indicate just what this term means. The brakes were doubtless in serviceable condition but "it is not believed that they were in that high state of efficiency which the requirements of safety demand in fast passenger train service."

The distant signal should have been located farther back. There is no physical reason why it could not be 800 ft. farther east; and, "had it been so located there is every reason to believe that this accident would not have occurred, even though the engineman exercised poor judgment in failing to apply the brake until within a short distance of the distant signal."

Here the main body of the report ends, with a statement of conclusions like that which is repeated at the close (see below). And then it goes on to discuss the superiority of steel over wooden cars. It is declared that at the present time "it is the exception rather than the rule to find wooden cars on the fast passenger trains" of many railroads. The New Haven company has ordered 354 new steel passenger cars. Of the 236 Pullman cars in use on its lines, 24 are of steel. The report then goes on to discuss the testimony of General Manager Bardo, and to refute the statements made by him intended to relieve the management of the road and throw responsibility on the brotherhood. From this part of the report we quote as follows:

"As to the enginemen's working agreement the rule has two plain and definite exceptions: (1) 'So far as it is possible

\*The report made to the railroad company by the inspectors, Messrs. Langan, Martin, Burton and Lorimer, indicates that the failure of this brake to act, when tested before the train was started out for the experiments, was due to the fact that the reservoirs had not been fully charged; that the test was made too soon after the engineman began to charge the train. This particular car had water-raising reservoirs and two brake reservoirs, the only car in the train that was thus fitted. The failure of the brake to operate occasioned no comment among the air brake men who were present. The members of the committee have no doubt that this car was fully charged at the time of the collision, and that, therefore, it operated the same as the other cars at that time.—EDITOR.

with the requirements of the service,' and (2) 'provided they are competent.' Primarily the determination of 'the requirements of the service' and 'competency' of engineers is for the management of the railroad. In this case it is shown that no reliable or effective system was in operation for the determination of the safety requirements of the service in the selection of an engineman for a particular service or for the determination of the competency of an engineman when he was first given a high speed passenger train. The neglect of precautions for safety was here a neglect upon points which the enginemans' agreement left open to the management. The mere absence of demerit marks while in freight service was considered a good record, sufficiently determined, to justify employment on fast passenger trains, a class of service requiring the highest degree of qualification. No determination of special qualification for higher grade of service was made. The agreement with the enginemans in no manner restricts examination or competency tests on the part of the management. . . . Other railroads have rules providing safeguards in this respect. The general manager stated his belief that the trouble arose from the employees' organizations and the attitude of the public. No organization but that of the New York, New Haven & Hartford Railroad Company is responsible for placing a man in charge of this locomotive without tests by traveling engineers. . . . Something is 'out of gear' where high-class trains may be given over to an uninstructed engineman. And this is true even if he is sent out on a run with the caution of his superior, 'Don't let it get away from you.' Here was doubt from the man who ought to know. It was Carroll's duty to know Doherty's capacity. . . . 'Man failure' can only excuse the railroad and its officials where the man has been properly tested and found to possess the positive qualifications required. There is no evidence which raises any doubt that for the work he had previously been engaged upon Doherty was competent, but when he was placed in charge of a new engine attached to one of the fast passenger trains some one in authority signally failed in duty. . . . It is but fair to say of the present general manager that his connection with this railroad is recent and that his efforts in the promotion of safety during the short time he has been in charge encourage the hope that he may succeed in placing it on a safer operating basis. . . . The change of power should have been at one definitely fixed place. A train running in two sections on very nearly the same time calls for special official supervision.

"The whole evidence taken in connection with the knowledge we have of the requirements of railroad service justifies the following conclusions:

"1. The engineman of second No. 53 did not have the special experience and instruction required for the operation of such a train.

"2. The railroad company had no reliable method for determining the capacity of enginemans before placing them in charge of high-speed passenger trains.

"3. There was negligence on the part of the corporation in putting in charge of such a train as second No. 53 an engineman inexperienced and uninstructed for this class of work.

"4. This railroad has no proper system of checking work reports so as to determine whether or not defects reported on locomotives are actually repaired. This lack of supervision is dangerous and it ought not to be permitted to continue.

"5. The distant signal at Stamford is too near the home signal, and should be at least 2,500 feet distant therefrom.

"6. Modern steel equipment for high-speed passenger trains should be installed at the earliest possible time, as recommended in previous reports of this commission, and legislation fixing such a time should be enacted without delay.

"7. Establishment of safer and more efficient operation of this railroad is immediately necessary if congressional legislation extending the scope of governmental regulation of railroads is not to be called for and justified in the interest of public safety."

## STATEMENTS BY THE RAILROAD COMPANY.

The railroad company issued a reply to the commission's report in which is the statement that "the report fails to state that the employment of this engineer was practically forced upon the New Haven Railroad by the engineers of the company." The agreement provided . . . that "Spare engineers shall be run first in and out so far as it is possible with the requirements of the service and, when engineers are assigned to temporary vacancies, they shall remain on same provided they are competent until the regular engineer returns." In the fall of 1912 an order was issued to the effect that spare engineers who had less than two years' experience, or two years' rating as engineers, would not be allowed to run through passenger trains. This order was protested by the engineers on the ground that the company had not adhered to the rule of giving the engineers thirty days' notice before amending existing rules. The company then issued the thirty days' notice, and when this time was up C. L. Bardo was general manager, having been appointed in the interim. The statement continues: "The engineers of the company, as was the case with all the eastern railroads, had been in an unsettled state of mind owing to the arbitration of the wage question, and Mr. Bardo, realizing this, and the engineers still protesting, asked the engineers to propose a counter ruling. The engineers offered the rule which is now in effect, which provides instead of two years' experience a requirement of one year's experience. Mr. Bardo accepted this amendment because it was essential to public safety that the engineers should get back to work without having another long dispute to settle with the company. Furthermore, not a single case could be found where the young engineers had been the cause of any trouble whatsoever. . . Mr. Doherty had an excellent record. The company had no way of telling that he was incompetent. . . ."

General Manager Bardo later issued another statement, saying that the company was carrying out the recommendations made by the Interstate Commerce Commission in connection with all of the three accidents—Bridgeport, Westport and Stamford.

## RAILWAY GENERAL FOREMEN'S ASSOCIATION.

The ninth annual convention of the International Railway General Foremen's Association opened at the Hotel Sherman, Chicago, Tuesday, July 15. F. C. Pickard, master mechanic of the Delaware, Lackawanna & Western at Buffalo, N. Y., presided. The invocation was made by Right Reverend Bishop Fallows. The association was welcomed to the city by Leon Hornstein, assistant city attorney, and response was made to the address of welcome by W. T. Gale, machine shop foreman of the Chicago & North Western.

## PRESIDENT'S ADDRESS.

President Pickard called attention to the necessity of the members carefully examining the exhibits, the sessions being restricted to the morning in order to give them an opportunity for so doing. He spoke of the valuable work done by the various technical journals in promoting shop efficiency and in assisting the organization in its work. The members were urged to thoroughly discuss the subjects on the program so that all might be benefited by the experiences of others, this being of utmost importance to derive the greatest benefit from the association.

All general foremen should be able to make an analysis of the local conditions, and surround themselves with the proper organization to meet the requirements of shop management. Organization is recognized as an economical necessity to effective control and co-operation in human effort. Organization deals with men and industrial organization includes the elements of production and transportation. He laid special stress on the conclusions reached by the association, emphasizing the fact that they should be carefully considered and seriously deliberated upon. The association should be sure it is right and then carry

out its convictions to the end. Promotions are attained by actively promoting the welfare of their companies. The men doing big things today are those who were yesterday doing the little things the best they knew how.

## MR. QUAYLE'S ADDRESS.

Robert Quayle, superintendent motive power and machinery of the Chicago & North Western, made an address in which he further emphasized the last part of the president's address concerning men who are doing big things today; they did the small ones yesterday and did them to the best of their ability. This he designated as one of the keynotes of success. He strongly favored the idea of such men as the general foremen getting together and exchanging ideas, stating that if each man would give to the convention some of his special kinks, those attending the association would have enough ideas to keep them busy for the rest of the year. Intelligent hard work is a great deal more important than geniuses. Each man should make an inventory of his accomplishments and character to see how much advance he has made throughout the year. Railway men must be progressive and try to constantly improve conditions. Men should do their work for the love of it, and have the desire of accomplishing things, and promotions will come automatically. Each man should obtain as his assistants men who are as good or even better than he is, so that when opportunity comes for a promotion there will be somebody capable of taking his place. Study the men under you, and get them to work with you. Push your men along to the front, giving them all the help you can, and they will become staunch friends and their conscientious assistance will boost you also. Have your work done with the minimum amount of effort. Have the tools in your shops located in a progressive sequence and always keep alive, infusing energy into the men under you. Above all things, such men as general foremen should have good, strong characters by which they can win the confidence both of the men under them and of their superiors, which in the long run will produce the results desired. President Pickard responded to Mr. Quayle.

*Secretary-Treasurer's Report.*—The secretary-treasurer's report showed a total of 214 members and a cash balance of \$620. No technical reports were presented on Tuesday, the opening day of the convention.

## SUPERHEATER LOCOMOTIVES.

P. C. Linck, general foreman of the Chicago & Eastern Illinois, Danville, Ill., presented a complete and interesting paper on the care and maintenance of locomotive superheaters. He mentioned as one of the most important items in keeping superheater locomotives in successful operation the necessity of having the flues and superheater units clean at all times. One man should be appointed to see that this work is done, and he should be held strictly accountable for it. Superheaters should be given a warm water test of about 100 lbs. approximately every month, and should be carefully examined for leaks or cracks in the header and in the unit pipes just below the ball joint. Trouble has also been experienced with the return bends leaking at the firebox end.

On the Chicago & Eastern Illinois it has been found necessary to use the best quality of cast iron for valve bushings, valve packing and cylinder packing on superheater engines, as otherwise they will give considerable trouble due to excessive wear. That road has experimented with a composition metal made of copper, lead, tin, zinc and antimony applied to the bottom of the piston head to reduce the wear. This application has been in use for six months and is still giving good service.

In regard to the lubrication, it is advised that the oil be admitted to the steam pipes far enough away from the valve to insure its becoming thoroughly atomized. In some cases it has been found necessary to admit the oil in the steam pipe on the inside of the smokebox; the oil pipe being entered through the side of the smokebox. Boosters have been found satisfactory in forcing the oil into the steam pipes. It has

been found that with an ordinary lubricator it takes 10 or 15 minutes for the oil to reach the end of the pipe, and for this reason the lubricator should be started before the throttle of the engine is open, and should give a small but a constant supply of oil. On a balanced compound locomotive equipped with a superheater it was found necessary to admit the oil to the steam pipe further from the cylinder than is ordinarily done on simple engines.

In some places it is the practice to splice unit pipes, broken just below the ball joint, with a steel coupling. Recently acetylene has been successfully used in repairing the return bends of the unit pipes at the firebox end. Unit pipes, 18 ft. or longer, should have two supports in the large flues; the first one 6 in. from the back end, and the second midway between the first and the end of the straight portion of the unit. It has been found that unit pipe ball joints made of copper give the best service.

When welding a large superheater tube care should be taken that it is uniformly supported in the welding machine and furnace. It has been found expedient to provide peep holes in the side of the smoke arch to allow for inspecting the front end, flue sheet, superheater and ball joint connections, so that the baffle plates will not have to be removed. These plates should have a tight fit and should be so constructed that they can be taken from the front end without removing the door ring. While on the road superheater engines should not carry more than two gages of water when working on level track, and the throttle should always be slightly cracked when drifting so that the steam may carry the oil to the valves and cylinders. It has been found that with the ordinary oil about 25 per cent. more should be used on a superheater locomotive than on a saturated locomotive of the same size and in the same service. In running, the full throttle is recommended wherever it is possible.

*Discussion.*—Extension piston rods greatly reduce the wear of pistons. Graphite used in correct proportions aids lubrication considerably. The superheater header should be bolted to the smoke arch. The combustion chamber on the Central of Georgia, together with the brick arch, reduces the plugging up of flues. The oil pipes should be direct with no pockets, and it is good practice to anneal them at general shoppings to prevent breakages. The oil should be thoroughly atomized. Pyrometers applied to superheater engines give good indication of operation. When converting a saturated steam engine to a superheater a small injector should be applied so as to feed water continuously without flooding the boiler. The greatest problem of superheaters is their maintenance at the engine house. Clean flues are an absolute necessity. The keeping in stock of superheater spare parts was strongly recommended. The subject was very thoroughly discussed and much valuable information was developed concerning the maintenance of superheater locomotives.

**COAL TRAFFIC IN INDIA.**—From a report just issued, it appears that the total output of the Indian coal mines in 1912 was, in round numbers, 14,000,000 tons, of which about 13,000,000 tons are obtained from Bengal coalfields. The East Indian Railway has, in one week alone (week ending May 24 last), moved about 23,000 carloads, which constitutes a record. If this state of traffic continues, one can safely predict that about 11,000,000 tons of coal will have been put on the rails on this one line alone during the year, in spite of the complaints of the colliery-owners on the score of inadequacy of rolling stock. One of the difficulties experienced by the East Indian Railway in dealing with the coal traffic to Calcutta is due to the handling of trains between Burdwan and Bande Junction. There are 20 passenger trains each way daily on this section, and the coal trains have necessarily to be sidetracked to make way for these. Hence there is frequent congestion, though the track is a double one. The remedy seems to be the laying of a third track.

## THE FREIGHT CLAIM ASSOCIATION.

The twenty-second annual meeting of The Freight Claim Association was held at Bluff Point, N. Y., June 18, with President F. E. Shallenberger (Star Union Line) in the chair and 170 members and proxies present. President L. F. Loree, of the Delaware & Hudson, delivered an address of welcome. President Shallenberger in his address dwelt on the work which had been accomplished during the year just ended, calling particular attention to the successful labors of the Conference Committee and its sub-committee with the representatives of the Interstate Commerce Commission and to the fact that this work had been carried on in a spirit of cordial co-operation. Reports from the Conference Committee and the committees on Constitution and By-Laws, Loss and Damage Rules, Overcharge Rules and Methods and Topics were considered, also the report from the special committee appointed to confer with a similar committee of the Association of American Railway Accounting Officers.

The Conference Committee reported that through its sub-committee, working in conjunction with Messrs. Lutz and Heiss, representing the Interstate Commerce Commission, a recodification of the loss and damage and the overcharge rules and rulings of the association had been prepared and recommended to the standing committee at their annual meeting for adoption by the association, the proposed recodification providing for only one set of rules (instead of two, in addition to the rulings, as at present) and working into the rules, as well as the constitution, all of the rulings except those dealing with matters of a general nature. This suggestion was accepted by the standing committees and their several reports to the association so read and were accompanied to the members of the association prior to the annual session by an appendix to the "call" setting forth in parallel form the present and proposed rules, also the changes proposed by the committees worked into the wording of the present rules and translated into that of the recodification. This plan of recodification was adopted without a dissenting vote, its use, with the new rule numbers, to become operative on September 1, 1913.

The work of the Conference Committee has reached a point where it is in an attitude of waiting upon the Interstate Commerce Commission for advices to enable it to complete its labors. Loss and Damage Rules 27 and 28, covering disposition of uncollectible freight charges, constitute one of the matters pending. It was felt that the association should be proud of the fact that its conferences with the commission had resulted so favorably.

President Shallenberger had received from Commissioner James S. Harlan a letter expressing great satisfaction with the work accomplished in the conferences during the past year. "The meetings between your representatives and the representatives of the Commission have conducted to a better understanding of the problems before us, and it is much to be hoped that our joint endeavors during the past months may be brought to a satisfactory conclusion at your meeting this week through the formal action of your association.

"The Commission has been called upon by committees of the Senate and House for an expression of views in relation to certain legislation looking to the regulation of the matter of claims against railroads. In several of these bills provisions are incorporated providing drastic penalties for the failure or refusal of a carrier to settle a claim within a definite period. In one instance the time limit of 90 days is provided. When these bills came before us I expressed somewhat urgently the hope that the Commission would advise the committees of the two houses that this is not an opportune time for the enactment of such laws, in view of the progress of our conferences with the Freight Claim Association touching the same matter. In our discussion of these questions I assumed the responsibility of giving to the Commission the assurance that the amended rules and regulations and forms growing out of our conferences would

result in the more expeditious adjustment of claims, and while safeguarding the reasonable rights of the claimants under the law would also safeguard the law itself in large measure. The Commission, accepting my view of the matter, reported to Congress, as I have said, that it regarded legislation on those questions as unnecessary at this time. I mention this matter because I wish your association to understand how definitely the Commission relies upon your association to lay before us for approval a system of rules and regulations that will reasonably accomplish the object of the proposed legislation, and also that you may fully understand the interest that the Commission is taking in the matter.

"Conference Ruling No. 15 entails some embarrassment upon carriers. Personally I am in favor of the plan of direct investigation, and I think the Commission will approve any suggestion from your association along that line, so long as it upholds the general principle that Conference Ruling No. 15 was intended to protect. . . . Original claim papers ought to be retained in the office of the carrier that pays the claim, so that they may there be accessible to our examiners.

"The matter of claims for concealed loss and damage and the disadvantageous position in which carriers are placed by the designs of unscrupulous shippers and consignees presenting such claims has had some consideration by the Commission during the past winter. If the courts at the instance of the Commission will impose severe and drastic penalties in a few such cases it will go far toward the elimination of such efforts to defraud the law and the carriers.

"You have doubtless observed that the Commission has recently restated its views in respect of the matter of interest on claims. It may be that the revised ruling is not altogether satisfactory. If that is the view of your association I invite a full expression from you. . . ."

The Conference Committee was continued for the year 1913-14, with the same objects and powers as heretofore. The Constitution was amended by providing for a fifth standing committee, to consist of five members, all to be appointed each year, and to be known as the "Committee on Accounts," to handle matters of joint interest with the committee of the Accounting Officers' Association.

The reports of the Loss and Damage and the Overcharge Committees dealt, to a large extent, with technical changes in the rules proposed by members and some slight amendments were made in several of them.

John S. Donaldson, assistant comptroller, Pennsylvania Railroad; Moultrie Hitt, secretary of the General Managers' Association of the Southeast, and C. W. Crawford, assistant to the general agent of the American Railway Association, addressed the meeting on matters of mutual and timely interest.

The special committee for conference with the committee of the Accounting Officers' Association joined the Accounting Officers' Committee in recommending a form of astray freight interline way-bill, which recommendation the Association concurred in.

It was decided to continue the publication of the Appeal Decisions, inasmuch as the secretary's report showed that during the past year there had been a falling off of about 25 per cent. in the claims submitted for arbitration, which was believed to be the result of these publications. With the use of the new code of rules, September 1, with an entirely new set of rule numbers, it will be important to have in published form awards of the appeal committee rendered in accordance with such recodification.

The secretary reported 401 members, representing 260,270 miles of rail lines, in addition to the mileage of the steamship members, in the United States, Canada and Mexico, there having been 27 new members added during the year. The financial affairs of the association were also reported in good shape with a balance in bank.

The following officers were elected for the ensuing year: President, George W. Perry (Great Northern); first vice-

president, J. W. Newell (Chicago, Burlington & Quincy); second vice-president, E. Arnold (Grand Trunk); secretary and treasurer, Warren P. Taylor, Richmond, Fredericksburg & Potomac, Richmond, Va.

It was decided to hold the next annual meeting at Galveston, Texas, May 20, 1914.

### MARK STEEL UNION.

A cold drawn steel union has recently been placed on the market by the Mark Manufacturing Company, Chicago. Cold drawn steel is used throughout its construction, and its coefficient of expansion is the same as that of the iron or steel pipe to which it is attached. This allows the union to expand in the same ratio as the rest of the pipe, which will tend to reduce leakage. Being made of cold drawn steel it will be free from the usual defects found in many cast unions. It will also have the additional strength inherent in cold drawn steel



Mark Cold Drawn Steel Union.

products. The various parts are made from flat sheet steel, and the process of manufacture of one of the members is shown in one of the illustrations. Discs are cut from flat strips of steel and drawn to deep cups from which the bottoms are punched. One end of the tube is then folded or rolled back on itself to form a reinforcement and later is pressed to its final shape, making a densified, hard steel seat. The lower end is then upset. The brass seat ring is also drawn cold from flat soft stock and annealed after drawing to keep it soft. Both the steel seat and brass ring are formed in dies and do not require machining or grinding.

The union is thoroughly sherardized after the threads have



Various Steps in the Manufacture of Mark Cold Drawn Steel Unions.

been cut, which will prevent corrosion. It is threaded to the Briggs standard for pipe threads and has the same taper as that of the pipe. Being made of steel it has the additional advantage of not retaining a permanent set when being tightly drawn up. This feature will insure the long life of the union and will eliminate the necessity of re-tightening it after being subjected to heavy pressures.

## Maintenance of Way Section.

THE attitude of the railways with reference to the future source of their tie supply stands out in marked contrast to the foresight shown in many of their large development plans. Comparatively few roads are making any attempt to provide beyond their immediate needs, and one purchasing officer of a prominent road stated, within the last few weeks, that his road had less than a month's supply of ties on hand. The last annual report of a large eastern road using over 1,000,000 ties annually and located close to the source of tie supply, showed that the cost of ties had risen from \$0.44 in 1903 to \$0.70 in 1912—an increase of 59 per cent. in 10 years. Upon the basis of the 1912 requirements the item of ties alone represented an increase in expenditure of a half million dollars in ten years. These figures would seem to show the advisability of a careful study of the future tie supply, for, rather than decline, this rate of increase bids fair to climb still faster.

THE opinion of railway men as to the value of cinders has been gradually changing until now many regard them as worse than valueless. In former years they were widely used as ballast on branch lines, but in many instances the practice has been discontinued, and they have come to be considered suitable only for filling in land for future development. However, careful study will frequently reveal ways in which cinders can be utilized profitably. Nearly every railway, not only in the West, but also in the East, has a considerable mileage of branch lines with mud ballast, or ballast little better than this, where cinders would be a great improvement. The practice of one western road could be profitably followed in many such cases. As the cinders have to be loaded on cars at the cinder pits for removal, this road loads them either in standard drop bottom cars which would otherwise return empty. These cars are hauled out to branch lines in the direction of the car movement, and are then taken out onto the branches by way freights and quickly unloaded. It has been found that by carefully making out a program in advance and working to it, it is possible completely to ballast a considerable mileage of branch line track with cinders each year at a cost very little above that of the actual labor of putting the cinders under the track.

THE floods throughout the Ohio valley the last week in March presented problems of unusual magnitude to track and bridge men alike. All lines within the flooded area were affected so that no relief was possible from other lines in the immediate vicinity. In many instances superintendents and other local officers were completely cut off from communication with their superiors or with the outside world. With bridges gone, embankments washed out, and supplies and reconstruction equipment unavailable, the problem presented was most serious and difficult. The only essential element present in sufficient quantity was labor. The way in which these lines were restored to operation under these highly adverse conditions is very creditable to all in charge and is at the same time instructive to other railway men. The description of the measures adopted on the Baltimore & Ohio in another column is of special interest, as it is the first article of such nature published. The description of the means adopted to hold piles in the swift current by scows, cables, etc., and of the methods used in dragging track back onto embankments is especially interesting and valuable.

TWO criticisms frequently made regarding college graduates in maintenance work are that they do not appreciate the importance of the small details making up a large part of the routine work, and that they do not know how to handle men. It must be admitted that in many instances these criticisms are well founded. To improve this condition, attempts have been

made at various times on the Big Four, Illinois Central and several other roads to employ college graduates as track apprentices in regular gangs or in similar positions where they are given opportunity to learn the fundamental details of maintenance work. These plans have failed from one cause or another. The co-operative courses at the University of Cincinnati are directed toward the same end. While these courses have proved very successful in industrial plants, they have not yet been tried enough in railway work to enable conclusive results to be secured, but the roads on which the students following them have been employed are highly pleased. The success of any such plan depends not only on the proper education of the student but also on the co-operation of the railways in making the positions sufficiently attractive financially to hold the men after they have left school and until they have become capable of filling more responsible positions in the service. By failing to attract and hold many good men many earlier plans have failed. Doubtless this has been due as much to improper administration of the plans as to the unfitness of the candidates themselves.

THE method adopted by the Burlington of concentrating the operation and repair of all of its construction equipment, including steam shovels, ditchers, cars, etc., under the supervision of one man, as described in another column, has several advantages. This one man is sure to become more familiar than anybody else with the possibilities of the equipment and crews and, therefore, more able to determine intelligently when proper results are secured. He can thus detect any work that falls below standard and concentrate his attention on it until it is brought up to what it should be. If these matters are left to the local divisional officers, as is the practice on many roads, opinions as to what are satisfactory results may be almost as numerous as the officers themselves. The plan described also enables the equipment and crews to be distributed to the best advantage and with the least lost motion. Without it the cost of surplus equipment which will be purchased and of the time that will be lost on individual jobs from lack of proper equipment may reach large sums. An arrangement such as this also relieves the division superintendents of many details connected with the organization for small pieces of work which they would otherwise have to handle. A very important advantage is in the more thorough repair work possible. When the shovels are overhauled in local division shops by regular machinists unfamiliar with such work and taking little interest in it, as is often the practice, individual responsibility is largely lost and the work is not done to a high standard, with the result that the danger of breakdowns is increased, and the expense of such breakdowns mounts very rapidly when work trains and men are thereby rendered idle.

WHILE the buying of large steam shovels and other heavy construction equipment is largely dependent on the policy of each railway with reference to contracting betterment work, the purchase of small equipment is justified because of its effect in reducing the amount of labor otherwise necessary; for while much of the heavier work can be contracted for if a road is so disposed, there is a very large amount of work divided into small units which it is difficult to contract for at a satisfactory price in dull seasons and which contractors will not bid on in busy years when larger pieces of work are available. This forces the railways to do much minor grading and bridge work with their own forces and affords a field for the economical use of small equipment that is not generally appreciated. In many instances a job of concreting too small to warrant the use of a large mixer is done by hand labor when a small portable mixer would do the work more economically. Similarly, much

work, such as the extension of yard tracks and the filling of trestles, is done by teams or with a long train haul, because it is not large enough to justify the cutting in of a large steam shovel with work train, when a small shovel and dump cars would perhaps take a little longer but would do the work more economically. Small equipment of other types can also be used in many cases to equal advantage. The smaller units of construction equipment which have been developed largely within the past few years are capable of a wide range of application in railway work, and will prove economical in many cases in replacing hand labor. This equipment does not interfere in any way with the use of larger equipment on other work, but has a field distinctly its own.

#### MOTOR CARS.

AS indicated by the records of service made by motor cars in the maintenance of way department, published in this issue, there is no longer reason to question the possibility of effecting material economies by the use of these cars under normal conditions. The practically universal approval reported by all roads which have used them shows that they are a success. At the same time, the conditions under which motor cars are operated must be carefully studied in order to secure the most satisfactory results. The same savings will not be effected by their installation on multiple track main lines, where the sections are but two or three miles long, as on double track lines with six or seven-mile sections, or on light traffic branch lines with sections 10 or perhaps 12 miles long. The installation of cars must also be carefully considered on those lines of heavy curvature where there is great danger of their being struck by trains. As a general rule the longer the sections and the lighter the traffic the greater are the economies possible.

In equipping a line with motor cars, care must also be taken that the sections are not lengthened beyond the economical limit. In some cases motor cars have failed to show savings when the fault has been not in the car but in the attempt to extend the sections over too much territory. Many roadmasters have opposed their adoption even when they were convinced that they were economical in themselves because they have seen the size of gangs reduced on other lines and attempts made to cover too much territory, with the result that the standards of maintenance were lowered. Some men claim that no laborers should be dispensed with when motor cars are adopted, but that economy should be effected by extending the jurisdiction of the foremen over longer sections, thus dispensing with a certain number of foremen.

In general, there are two methods of justifying expenditure for motor cars. One is to determine the decrease in the amount of time spent by the gangs in going to and from work and to compute the wages of all the gangs for the time saved as the saving attributable to motor cars. The other method is to assume that the gain from reducing the time the men are on the road takes the form, not of actual reduction of expenditures, but merely of increase of the time that the men are actually engaged in useful labor, and therefore computes the saving of expenditure made only on the basis of the number of employees eliminated. If the cost of motor cars can be justified on this latter basis alone, as is being done on a number of railroads, the added advantage of the increased amount of useful labor done by each gang will be a clear gain in the form of better maintenance.

A few of the most important points to be considered when making a complete study of motor cars with a view to recommending the type of car best adapted for the conditions existing on any particular road are mentioned in the tabulation published elsewhere in this issue. Aside from these, one must consider whether the water cooled or air cooled engine is best adapted to his service. This will depend largely on whether the car is wanted for long continued running, as in inspection service, or for intermittent travel for short distances, as in section work.

There must also be considered the amount of power required, which determines the number of cylinders and whether the drive should be direct connected or friction. The closer these and other details are studied on the basis of the service desired the more intelligently can one select the car best fitted for his work. Several roads are conducting very careful tests and keeping accurate records of the results secured by motor cars of various types. The results of these experiments will do much to establish definitely the advantages of the different types for special work. Cars bought as the result of this information should show even greater economies than have those which have been used up to this time, although the results already secured show that the motor car is here to stay.

#### THE EFFECT OF THE FISCAL YEAR UPON MAINTENANCE.

THE advantages of starting the season's maintenance work early in the spring have been frequently commented on in these columns. The principal obstacle to the adoption of such a plan is that the fiscal year closes in the middle of the natural season for maintenance work. The more prosperous roads very largely disregard the fiscal year in making appropriations for new work or for repairs. Roads not so fortunate financially, and there are many, find it necessary to curtail expenditures in the spring year after year to make satisfactory showings of net earnings and thereby maintain their credit. To the executive officers of these roads, June 30 is a very important date. No one acquainted with the conditions will maintain that the policy of deferring maintenance work until the middle of the summer is an economical one, and while theoretically it does not appear to be advisable from any standpoint to sacrifice real economy to make a "paper showing," the pressure of the financial interests frequently makes this necessary. Poor earnings mean poor credit, and poor credit means increased cost of money. The extent to which this affects the operation and financing of our railways is illustrated by the policy recently adopted in the rebuilding of a large road. The first year the new management had control liberal appropriations were made for the improvement of track and bridges, the extension of passing tracks, etc., to handle an increased business. The following year expenditures were reduced almost to the minimum, and every attempt was made to increase the net earnings, in order to establish a credit and enable other improvements to be financed at a more reasonable rate.

The important influence of the fiscal year upon expenditures for maintenance and the serious disadvantages resulting from deferring the starting of work until July 1 seem to afford a strong argument for changing the railway fiscal year to end December 3 instead of June 30. Officers in charge of maintenance and construction work, who are those most directly affected by the present system, can well afford to individually emphasize the importance of this change to their managements or collectively bring it before the railways through the proper organization. Aside from the actual economy of properly distributing work throughout the season, an element of increasing perplexity is the growing scarcity of labor, which requires that the supply available be utilized to the best advantage. This means that instead of allowing a large part of the labor to remain idle during the early months, or to drift into other lines of work, it should be placed at work as early in the spring as weather conditions will permit, for it is most certainly true that "the early road catches the hobo." The advantages and large economies that would result from a change in the fiscal year whereby appropriations for the season's work would be made available early in the spring instead of at midsummer or in the fall, as is now frequently the case, are evident. That this is not impractical under present conditions is shown by the fact that at least two of the largest systems of the country, the Pennsylvania and the New York Central, operate with the fiscal year ending with the calendar year.



## SERVICE DATA FOR MOTOR CARS

## SECTION GANG.

Name of Road.	No. of Motor Cars in Service.	Maker.	Length time in service.	Cost of repairs and method keeping cars.	Cost of fuel per month or per 100 miles.
(1) Ann Arbor .....	6	F. M. Co.	3 months.	Batteries only; \$0.112 per 100 mi. \$7.89 per month.	40c. per 100 mi. 47c. per 100 mi.
(2) Atchison, Topeka & Santa Fe..... (Western Lines Only.)	59	51 Autrakars 8 F. M. Co.	14 months (average)		
(3) Atlantic Coast Line.....	12	F. M. Co.	2-29 mos., 4-22 mos., 4-13 mos., 2-6 mos.	Kept in repair by men using them.	About 2.5 gal. per 100 mi.
(4) Baltimore & Ohio.....	17	F. M. Co.	6 mos. to 4 yrs.	Foremen repair own cars, sometimes with help of signal repairman. \$1 per month.	Gasoline, 80c. per 100 mi. Lub. oil, 15c. per 100 mi. Batteries, 15c. per 100 mi.
(5) Boston & Albany.....	4	F. M. Co.	6 mos.	About 45c. per mo. Minor repairs made by foreman, others by supervisor.	\$1.33 per 100 mi. Can make 350 to 400 mi. per mo.
(6) Boston & Maine.....	56	40 F. M. Co. 16 Rockford	35-1 yr., 21-6 mos.	Insp. repairs troubles which foremen cannot repair.	76c. per 100 mi.
(7) Buffalo, Rochester & Pittsburgh.....	1	F. M. Co.	6 mos.	Cars looked after by road-masters.	\$1.60 per 100 mi.
(8) Central New England Ry.....	...	...	...	...	...
(9) Central of Georgia Ry.....	3	F. M. Co.	1-3 mos., 2-1 mo.	...	...
(10) Central Vermont Ry.....	...	...	...	...	...
(11) Chicago & North Western.....	267	9 F. M. Co., 142 Waterloo, 94 Fairmont, 22 Misc.	Average 1 yr.	45c. per month.	\$2.25 per mo.
(12) Chicago Great Western.....	142	F. M. Co. and Rockford.	26-15 mos., 34-2½ yrs., 49-2 yrs., 33-16 mos.	Average \$2.95 per month.	Average \$2.52 per mo.
(13) Chicago, Milwaukee & St. Paul..... (Puget Sound Lines.)	48	F. M. Co., Duntley and Rockford.	1 to 4 yrs.	\$2 to \$10 per mo. Light repairs made on line, heavy repairs in shop.	\$2 per 100 mi.
(14) Chicago, Minneapolis & St. Paul.....	295	Various makes.	Various periods; some cars several years.	Record discontinued.	Record discontinued.
(15) Cleveland, Cincinnati, Chic. & St. L. ..	57	41 F. M. Co., 8 Rockford, 8 Buda.	About 1 yr.	Average \$0.88 per mo. Repair parts ordered from mfrs.; repair work done by our men.	20 mi. per gal. of gasoline 86c. per 100 mi.
(16) Colorado & Southern.....	21	F. M. Co.	1 to 2 yrs.	Repairs made by company's shops.	\$4 per 100 mi.
(17) Colorado Midland .....	5	F. M. Co.	2½ yrs.	Light repairs made by foreman in charge. Cost included in operation.	\$1.50 per 100 mi.; including lubric. oil and repairs.
(18) Cumberland Valley R. R.....	5	F. M. Co.	9 mos.	Kept in repair by our shops.	\$4 per mo.
(19) Delaware & Hudson.....	1	F. M. Co.	15 mos.	\$2 per month.	\$1.25 per 100 mi.
(20) Duluth, South Shore & Atlantic.....	...	...	...	...	...
(21) Erie R. R.....	45	4 F. M. Co., 38 Rockford, 3 Buda.	2 mos. to 5 yrs.; average 18 mos.	\$1 per mo. Kept by signal maint. and section men.	\$1.15 per 100 mi.
(22) Grand Rapids & Indiana.....	18	10 F. M. Co., 3 Rockford, 5 Converted Hand Cars.	Average 2½ yrs.	...	\$4.40 per mo., or \$1 per 100 mi.
(23) Great Northern Ry.....	254	144 Fairmont, 75 Waterloo, 35 Miscellaneous.	211 cars less than 12 mos.: 37 cars 1 to 2 yrs.; 6 cars more than 2 yrs.	Light repairs by traveling experts and foremen; heavy repairs at car shop. 192—under \$0.50 per mo., 59—\$0.50 to \$1 per mo., 3—over \$1 per mo.	66—\$1 to \$2 per mo.; 104—\$2 to \$3 per mo.; 78—\$3 to \$4 per mo.; 6—over \$4 per mo.
(24) Kanawha & Western.....	1	Rockford.	6 mos.	Each foreman keeps own car in repair; ordering the necessary parts.	...
(25) Lake Erie & Western.....	21	7 Rockford, 14 F. M. Co.	1 to 3 yrs.	Repairs by shops and local repairmen; \$1.84 per mo.	68c. per 100 mi.
(26) Lake Shore & Michigan Southern....	44	F. M. Co., Buda.	6 mos. to 3 yrs.	...	...
(28) Minneapolis & St. Louis.....	10	ROCKFORD, J. F. M. Co.	...	...	100 mi.
(29) Missouri, Kansas & Texas.....	88	Waterloo, Fairmont and F. M. Co.	3 mos.	\$3.50 per mo. Motor car inspector on each district. Damaged cars sent to shop.	\$1.80 per mo.
(30) Missouri Pacific .....	275	180 F. M. Co., 70 Rockford, 25 Miscellaneous.	219-1 yr., 53-2 yrs., 1-3 yrs., 1-4 yrs., 1—over 4 yrs.	\$0.88 per 100 mi. Repairman makes light repairs; heavy repairs at the shops.	71c. per 100 mi.
(31) Nashville, Chattanooga & St. Louis..	6	F. M. Co.	1-2 yrs., 1-4 mos., 1-14 mos., 2 just installed.	...	\$1.80 per mo., including batteries.
(32) New Orleans, Mobile & Chicago....	14	F. M. Co. and Rockford.	1 to 5 yrs.	...	\$2 per mo.
(33) New York Central & Hudson River..	16	13 F. M. Co., 3 Ry. Supply Co.	15—new, 1-2 yrs.	\$1 per 100 mi.	...
(34) Norfolk & Western.....	36	21 F. M. Co., 7 Rockford, 8 Buda.	6 mos. to 3 yrs.	\$2.08 per mo.	\$3.44 per mo.
(35) Northern Pacific .....	122	40 F. M. Co., 7 Rockford, 2 Uhler, 3 Duntley, 45 Waterloo, 1 Buda, 23 Fairmont, 1 Detroit.	Maximum 3 yrs.; average 10 mos.	Probably \$1.50 per mo. Light repairs by foreman; heavy repairs at shop.	60c. to 80c. per 100 mi.
(36) Oregon-Washington R. R. & Nav....	14	11 F. M. Co., 3 Waterloo	10-21 mos.; 3-3 mos., 1-9 mos.	\$3.72 per mo. Repairs at shops.	\$3.50 to \$425 per mo.
(37) Pittsburgh & Lake Erie.....	3	F. M. Co.	Average 9 mos.	...	62c. to 92c. per 100 mi.
(38) Saint Joseph & Grand Island.....	19	18 Uhler, 1 F. M. Co.	6 mos.	\$1.10 per mo.	\$1.49 per mo.; 25c. per 100 mi.
(38a) St. Louis & San Francisco.					
(39) San Pedro, Los Angeles & Salt Lake— Los Angeles Division.....	6	F. M. Co.	1 yr.	Maintained by M. W. Dept.	\$1.25 per 100 mi.
Salt Lake Division.....	8	F. M. Co.	1½ yrs.	94c. per mo. Water service men keep all cars repaired.	Gasolene, 86c. per 100 mi. Oil, \$1.24 per 100 mi.
(40) Southern Railway .....	35	30 F. M. Co., 1 Buda, 4 Rockford.	Maximum 3 yrs.	Average \$3 per mo.	Average \$3 per mo.
(41) Southern Pacific .....	33	30 F. M. Co., 3 Buda.	Average 13 mos.	Average \$1.46 per mo.	Average \$1.01 per 100 mi.
(42) Spokane, Portland & Seattle.....	...	...	...	...	...
(43) Sunset-Central Lines— Houston & Texas Central.....	4	F. M. Co.	2 yrs.	\$0.40 per mo.	\$1 per 100 mi.
Texas & New Orleans.....	5	F. M. Co.	3 yrs.	\$9.44 per mo. Repairs	\$1.66 per mo.

# ARS USED BY THE MAINTENANCE OF WAY FORCES, INCLUDING

BRIDGE GANG.							SIGNAL MAINTAINERS.				
month iles. mi.	No. of Motor Cars.	Maker.	Length time in service.	Cost repairs and method keeping cars.	Cost fuel per month or per 100 miles.	No. of Motor Cars.	Maker.	Length time in service.	Cost repairs and method keeping cars.	Cost fuel per month or per 100 miles.	
100 mi.	(1) ..					9	F. M. Co.	5 yrs.	\$1.33 per mo.	26c. per 100	
100 mi.	(2) 1	F. M. Co.	3 yrs.	\$2.50 per mo.	25c. per 100 mi.						
100 mi.	(3) ..					7	6 Fairb. M. 1 Waterloo.	2—2 yrs., 4—1 yr., 1—6 mos.	About \$1 for light and \$2 for heavy car per mo.	About 2 gal. light and 2.5 heavy per 100	
100 mi.	(4) ..					3	F. M. Co., Rock- ford, Buda.	1 to 5 yrs.	Signal supervisor keeps car in re- pair.		
1. Cars mi. per	(5) ..										
mi.	(6) ..					2	1 F. M. Co. 1 Buda.	1—4 yrs. 1—2 yrs.	Repaired by em- ployee operating car.		
mi.	(7) ..										
.....	(8) 6	F. M. Co. and Rockford.	4 mos.		90c. per 100 mi.	2	F. M. Co. and Rockford.	3 mos.—F. M. Co. 10 mos.—Rockfd.		90c. per 100	
.....	(9) ..										
.....	(10) ..										
.....	(11) 18	3 F. M. Co., 6 Fair- mont, 7 Waterloo, 2 Rockford.	Av. 1 1/4 yrs.		\$1.80 per mo.	30	11 Adams, 8 Rock- ford, 5 F. M. Co., 4 Fairm't, 2 Mis.	Av. 2 1/4 yrs.	75c. per mo.	\$2.78 per m	
er mo.	(12) 15	F. M. Co. and Rockford.	5—11 mos. 5—2 yrs. 5—8 mos.	Av. \$2.65 per mo.	Av. \$2.32 per mo.	15	F. M. Co. and Rockford.	10—25 mos., 1— 2 1/2 yrs., 3—2 yrs., 1—9 mos.	Av. \$4.58 per mo.	Av. \$3.11 per	
ni.	(13) 13					18					
nued.	(14) 127	Various makes.	Various periods.	Record discontinued.	Record discontinued.	8	Various makes.		Record discontinued.		
gasolene. mi.	(15) ..										
mi.	(16) 8	F. M. Co.	1 to 2 yrs.		\$4 per 100 mi.						
including repairs.	(17) ..										
.....	(18) ..					1	F. M. Co.	10 mos.	Kept in repair by our shops.		
mi.	(19) ..					3	F. M. Co.	2 yrs.	\$1.30 per mo.	\$2.36 per m	
.....	(20) ..										
mi.	(21) 4	1 Buda, 3 Rockford	2—2 mos. 2—3 yrs.	\$1 per mo. Kept by operator.	\$1 per 100 mi.	24	10 Buda, 7 F. M. Co., 3 Rockford, 4 made in comp. shops.	6 mos. to 6 yrs. Average 3 yrs.	75c. per mo. by signal main- tainer.	75c. per 100	
\$1 per	(22) ..										
er mo.; er mo.; er mo.; er mo.	(23) 3	1 Fairmont, 1 Waterloo, 1 Misc.	2 cars less than 12 mos.; 1 car 1 to 2 yrs.	Under 50c. per mo.	\$1 to \$2 per mo.	9	3 Buda, 6 Mudge-Adams.	2—less than 12 mos. 3—1 to 2 yrs. 4—more than 2 yr.	3—50c. to \$1 mo. 6—over \$1 mo.	\$1 to \$2 per	
.....	(24) 2	Rockford.	1—6 mos. 1—18 mos.			1	Buda.	5 mos.			
mi.	(25) 1	F. M. Co.	2 yrs.	36c. per mo.	93c. per 100 mi.	1	Adams.	3 mos.		50c. per 100	
.....						61	F. M. Co., Buda.	1 to 8 yrs.	\$1.25 per mo.	80c. per 100	
mo.	(29) 4	Fairmont, Waterloo, F. M. Co.	3 mos.		\$2.15 per mo.						
0 mi.	(30) 29	19 F. M. Co., 8 Rockford, 2 Miscellan.	23—1 yr. 5—2 yrs. 1—3 yrs.	\$2.21 per 100 mi.	85c. per 100 mi.	9	F. M. Co.	1—2 yrs., 3—3 yrs., 1—4 yrs., 4—over 4 yrs.			
including .....	(31) ..					1	F. M. Co.	2 1/4 yrs.		\$1.80 per mo., cluding batter	
.....	(32) 2	F. M. Co. and Rockford.	1—1 yr. 1—8 mos.								
.....	(33) ..					2	Buda.	1—new, 1—2 yrs.	50c. per 100 mi.		
mo.	(34) 4	3 F. M. Co., 1 Buda.	1 yr.		\$3.50 per mo.	69	54 F. M. Co., 15 Buda.	1 yr. to 7 yrs.	\$3.23 per mo.	\$4.90 per m	
er 100 mi.	(35) 2	1 Waterloo, 1 F. M. Co.	1—1 yr. 1—3 yrs.	Approx. \$1 per mo.	52c. to 68c. per 100 mi.	35	26 Buda, 6 Rockford, 3 F. M. Co.	3 yrs. and less.	Repairs made by maintainers.	\$3.10 per m	
per mo.	(36) ..					15	11 Adams-Mudge, 3 F. M. Co., 1 Buda.	11—2 yrs. 6 mos. 3—2 yrs. 7 mos. 1—1 yr. 1 mo.	Av. 61c. per mo. Repairs by sig- nal maintainers.	2 gal. per 100 or \$4 per m	
er 100 mi.	(37) ..					2	F. M. Co.	5 yrs.	Repairs made by men in charge.	30c. per 100	
25c. per	(38) ..										
.....	(39) ..										
00 mi.	(40) ..					6	5 F. M. Co., 1 Buda.	Max. 2 yrs.			
er 100 mi.; er 100 mi.	(41) 1	Rockford.	2 yrs.								
per mo.											
per 100 mi.	(42) 1 (See Remarks)	Buda.	30 mos.	Av. per mo. \$2.	30c. per 100 mi.	1	Buda.	30 mos.	Av. \$2 per mo.	30c. per 100	
00 mi.	(43) 3	F. M. Co.	2—2 yrs. 1—1 yr.		\$1.20 per 100 mi.		4	2 F. M. Co.	5 yrs.	\$4.50 per	

# INCLUDING SECTION GANGS, BRIDGE GANGS, SIGNAL MAINTAINERS AND

INERS.

INERS.	Cost fuel per month or per 100 miles.	INSPECTION.						MISCELLANEOUS.						
		Name of Road.	No. of Motor Cars.	Maker.	Length time in service.	Cost repairs and method keeping cars.	Cost fuel per month or per 100 miles.	No. of Motor Cars.	Maker.	Length time in service.	Cost repairs and method keeping cars.	Cost per month or per 100 miles.		
Cost repairs and method keeping cars.	Cost fuel per month or per 100 miles.													
\$1.33 per mo.	26c. per 100 mi.	(1) Ann Arbor	...	...	.....	.....	.....	...	...	.....	.....	.....	.....	
		(2) Atch., Top. & S. F. (West'n Lines Only.)	20	F. M. Co.	4 yrs. 3 mos.	\$2.81 per mo.	24c. per 100 mi.	6	F. M. Co.	4 yrs. 9 mos.	69c. per mo.	11c. 100	100	
About \$1 for light and \$2 for heavy cars per mo.	About 2 gal. for light and 2.5 for heavy per 100 mi.	(3) Atlantic Coast Line	15	F. M. Co.	.....	About \$1 for light and \$2 for heavy cars per mo.	2 gal. for light and 2.5 for heavy per 100 mi.	2	F. M. Co.	7 mos.	About \$1 for light and \$2 for heavy cars per mo.	2 gal. for light and 2.5 for heavy per 100 mi.	100	
Signal supervisor keeps car in repair.	.....	(4) Baltimore & Ohio	4	F. M. Co. and Rockford.	1 to 3 yrs.	Track superv. keeps car in repair.	.....	4	Fairb.-M.	1 to 3 yrs.	Div. engrs. and mast. carp. cars looked after by signal repair-men.	.....	.....	
Repaired by employee operating car.	.....	(5) Boston & Albany	...	...	.....	.....	.....	...	...	.....	.....	.....	.....	
		(6) Boston & Maine	3	1 F. M. Co. 2 Rockford.	1-3 yrs. 2-1½ yrs.	Repaired by employee operating car.	.....	...	...	.....	.....	.....	.....	
		(7) Buff., Roch. & Pittsb.	2	F. M. Co.	9 mos.	Cars looked after by roadmasters.	\$1.25 per 100 mi.	1	Fairb.-M.	6 mos.	Repairs by roadmasters.	\$1.75 for gang car trailer 100	100	
	90c. per 100 mi.	(8) Central New Eng. Ry.	2	F. M. Co. and Rockford.	3 yrs.—Rockf.	.....	90c. per 100 mi.	...	...	.....	.....	.....	.....	
		(9) Central of Georgia Ry.	21	F. M. Co.	2 to 3 mos.	38c. per mo.	\$3.68 per mo.	...	...	.....	.....	.....	.....	
		(10) Central Vermont Ry.	1	F. M. Co.	4 yrs.	\$64.52. General repairs at factory.	40c. per 100 mi.	...	...	.....	.....	.....	.....	
75c. per mo.	\$2.78 per mo.	(11) Chicago & Nor. West'n	23	2 Rockford. 16 F. M. Co. 2 Adams. 2 Dunleavy. 1 Waterloo.	Av. 5 yrs.	45c. per mo.	\$2.90 per mo.	11	5 Fairb.-M. 3 Fairmont. 2 Adams. 1 Rockford.	Av. 2 yrs.	52c. per mo.	\$3 per	.....	
Av. \$4.58 per mo.	Av. \$3.11 per mo.	(12) Chicago Gt. Western	16	F. M. Co. and Rockford.	4-2½ yrs. 5-2½ yrs. 2-2 yrs. 5-2½ yrs.	Av. \$2.03 per mo.	Av. \$2.06 per mo.	8	Fairb.-M. and Rockford.	2-2 yrs. 2-2½ yrs. 3-2 yrs. 1-2½ yrs.	Av. \$2.70 per mo.	Av. \$ per mo.	Av. \$ per mo.	
		(13) Chicago, Mil. & St. P. (Puget Sd. Lines.)	3	...	.....	.....	.....	16	...	.....	.....	.....	.....	
Record discontinued.	.....	(14) Chicago, Minn. & St. P.	...	...	.....	.....	.....	26	Various makes.	.....	Record discontinued.	.....	.....	
		(15) C., C., C. & St. L.	...	...	.....	.....	.....	...	...	.....	.....	.....	.....	
		(16) Colorado & Southern	6	F. M. Co. and Rockford.	1 to 3 yrs.	.....	\$4 per 100 mi.	2	...	1 to 3 yrs.	.....	.....	\$4 per 1	1
		(17) Colorado Midland	1	Converted Automobile.	3 yrs.	.....	\$2 per 100 mi. Including lub. oil and repairs.	...	...	.....	.....	.....	.....	.....
Kept in repair by our shops.	.....	(18) Cumberland Val. R. R.	1	F. M. Co.	3 mos.	Kept in repair by our shops.	.....	...	...	.....	.....	.....	.....	.....
\$30 per mo.	\$2.36 per mo.	(19) Delaware & Hudson	2	1 Buda, 1 F. M. Co.	2 yrs.	\$1.25 per mo.	80c. per 100 mi.	...	...	.....	.....	.....	.....	.....
		(20) Duluth, So. Shore & A.	4	2 F. M. Co. 2 Buda.	1 yr.	\$9 total; labor only. One man cares for all cars.	\$1.12 per 100 mi.	...	...	.....	.....	.....	.....	.....
75c per mo. Kept by signal maintainer.	75c. per 100 mi.	(21) Erie R. R.	30	10 Buda. 16 F. M. Co. 4 Rockford.	4 mo. to 6 yr. Av. 18 mos.	\$1 per mo. Kept by signal maintainer.	\$1 per 100 mi.	10	3 F. M. Co. 1 Rockford. 4 Buda. 2 Erie.	1 mo. to 7 yrs. Av. 18 mo.	\$1 per mo.; kept by signal maintainer.	\$1 per 100 mi.	100	100
		(22) Grand Rapids & Ind.	...	...	.....	.....	.....	2	...	.....	.....	.....	.....	.....
3-50c. to \$1 mo. 6-over \$1 mo.	\$1 to \$2 per mo.	(23) Great Northern Ry.	35	1 Buda. 16 Mudge-Ad. 11 F. M. Co. 7 Misc.	11-less than 12 mos. 6-1 to 2 yr. 18-over 2 yr.	25 under 50c. per mo. 9-50c. to \$1 mo. 1-over \$1 mo.	17-\$1 to \$2 mo. 9-\$2 to \$3 mo. 9-over \$4 mo.	11	5 F. M. Co. 3 Mudge-Ad. 3 Misc.	1-less than 12 mos. 3-1 to 2 yrs. 7-over 2 yrs.	4-under 50c. mo. 7-50c. to \$1 mo.	8-\$1 to 1-\$2 to 2-\$3 to	100	100
		(24) Kanawha & Western	1	F. M. Co.	18 mos.	.....	.....	...	...	.....	.....	.....	.....	.....
	50c. per 100 mi.	(25) Lake Erie & Western	1	F. M. Co.	2 yrs.	\$1.22 per mo.	70c. per 100 mi.	3	1 Rockford. 1 F. M. Co. 1 built by roadmaster	2 yrs.	\$1.84 per mo.	68c. 100	100	100
\$1.25 per mo.	80c. per 100 mi.	(26) Lake Shore & Mich. S.	25	F. M. Co.	5 to 12 yrs.	\$1.25 per mo.	90c. per 100 mi.	...	...	.....	.....	.....	.....	.....
		(28) Minneapolis & St. L.	...	...	.....	.....	.....	...	...	.....	.....	.....	.....	.....
		(29) Missouri, Kan. & Tex.	17	F. M. Co.	6 mo. to 2 yr.	80c. per 100 mi.	.....	...	...	.....	.....	.....	.....	.....
		(30) Missouri Pacific	16	F. M. Co.	6-2 yrs. 10-3 yrs.	\$1.47 per 100 mi.	93c. per 100 mi.	34	25 F. M. Co. 3 Rockford. 6 Miscel.	8-1 yr; 1-2 yr; 5-3 yr; 4-4 yr; 16-over 4 yr.	.....	.....	.....	.....
	\$1.80 per mo., including batteries.	(31) Nash., Chat. & St. L.	2	F. M. Co.	1-1 yr. 1-2½ yrs.	.....	\$1.80 per mo., including batteries.	...	...	.....	.....	.....	.....	.....
		(32) New Orl., Mobile & C.	2	F. M. Co.	8 mos.	.....	.....	1	...	.....	.....	.....	.....	.....
		(33) N. Y. Cen. & H. R.	44	F. M. Co.	Av. 7 yrs.	Av. about 80c. per 100 mi.	.....	6	2 Buda. 4 F. M. Co.	5-less than 2 yrs.	50c. to \$1 per 100 mi.	.....	.....	.....
\$2.23 per mo.	\$4.90 per mo.	(34) Norfolk & Western	...	...	.....	.....	.....	...	...	.....	.....	.....	.....	.....
Repairs made by maintainers.	\$3.10 per mo.	(35) Northern Pacific	21	5 Rockford. 2 Dunleavy. 6 Buda. 8 F. M. Co.	Max. 4 yrs. Av. 2 yrs.	75c. per mo.	52c. to 95c. per 100 mi.	1	F. M. Co.	19 mos.	.....	52c. per 100 mi.	.....	.....
Av. 6c. per mo. 2 gal. per 100 mi., Repairs by signal maintainers. Repairs made by men in charge.	30c. per 100 mi.	(36) Ore.-Wash. R. R. & N.	1	F. M. Co.	3 yrs.	\$1.25 per mo. Repairs by shop men.	\$1.15 per mo.	...	...	.....	.....	.....	.....	.....
		(37) Pittsburgh & Lake Erie	2	...	1-1 mo. 1-10 mos.	.....	42c. per 100 mi.	2	F. M. Co.	.....	.....	.....	.....	.....
		(38) St. Joseph & Grand Isl.	...	...	.....	.....	.....	...	...	.....	.....	.....	.....	.....
		(39) San P., L. A. & S. L.— Los Angeles Div.	4	F. M. Co.	10 yrs.	.....	50c. per 100 mi.	2	1 Buda. 1 built in shop	1 yr.	.....	.....	.....	\$1.75 100
		Salt Lake Div.	7	3 F. M. Co. 4 Buda.	1½ to 8 yrs.	.....	About 30 mi. per gal.	2	1 F. M. Co. 1 built in shop	2½ yrs.	.....	.....	.....	About 8 per
		(40) Southern Railway	16	9 F. M. Co. 6 Buda. 1 Con. Form & Eng. Co.	Max. 7 yrs.	.....	.....	...	...	.....	.....	.....	.....	.....
		(41) Southern Pacific	...	...	.....	.....	.....	...	...	.....	.....	.....	.....	.....
Av. \$2 per mo.	30c. per 100 mi.	(42) Spokane, Port. & Seattle	5	F. M. Co.	2-4 yrs. 1-1 yr.	45c. per 100 mi.	.....	...	...	.....	.....	.....	.....	.....
		(43) Sunset-Central Lines— Houston & Tex. Cen. Texas & New Orl.	1	F. M. Co.	1½ yrs.	.....	.....	...	...	.....	.....	.....	.....	.....

# FOR INSPECTION AND OTHER PURPOSES

Cost fuel  
per month  
or per  
100 miles.  
.....

11c. per  
100 mi.  
.....

gal. for light  
and 2.5 for  
heavy per  
100 mi.  
.....

1.75 for extra  
gang car and  
trailer per  
100 mi.  
.....

\$3 per mo.

Av. \$2.19  
per mo.

4 per 100 mi.

1 per 100 mi.

-\$1 to \$2 mo.  
-\$2 to \$3 mo.  
-\$3 to \$4 mo.  
.....

68c. per  
100 mi.

52c. per  
100 mi.  
.....

\$1.75 per  
100 mi.  
About 80 mi.  
per gal.  
.....

	To what extent have you been able to lengthen track sections and maintainer's territory and what have been your relative savings in labor?	Do you secure greater efficiency from your labor?	Remarks.
(1)	100 per cent. in length of section.	Yes.	22 per cent. more efficiency in men and 17 per cent. less expense for maintenance of cars.
(2)	Cut out 7 sections on one division, another 6 sections about 40 mi., another division handling 2 sections, one 25 mi. and other 54 mi. Saving, 1912, with motor car, \$8,028.58. One pumper handled 3 pumping stations by use motor car; saving salary of 2 men.	Yes. Men are in better condition to work after riding motor car to point where work is to be done. Can get to work quicker and remain longer.	Signal maintainers, roadmasters and general foremen are able to make quicker, closer and more detailed inspection. Greatest disadvantage is foremen do not understand cars and trouble is experienced.
(3)	One section foreman cut off, placing 2 gangs under 1 foreman. Signal maintainer's territory doubled.	Very much greater efficiency and longer hours on the work.	Disadvantage is danger from trains. Motor cars help hold labor and keep the men more contented.
(4)	Sections lengthened only on light traffic branches. Saving in cost of supervision necessary to justify use of motor cars on ordinary grades.	Increased efficiency cannot be measured in money. Shown by work accomplished.	On account of danger, motor cars are used only on branches and light traffic lines; 8 h. p. car has proven too light for large gangs on 0.8 per cent. grade.
(5)	Sections increased from 5 to 6 mi. to 10 to 12 mi. with annual saving of \$3,502.14, against which is first cost of motor cars, gasolene, storage tanks, etc., equal to \$884.81.	Foremen are able to secure a better class of labor.	Frost makes car slip. Has to be pushed like hand car. After train has passed motor car travels all right.
(6)	Double length of sections and in most cases dispense with services of one foreman.	Yes.	.....
(7)	Section not lengthened.	Yes. Men are able to do more and better work in addition to the saving in time effected.	Motor inspection cars make better supervision possible at considerably reduced cost over old method of making inspection trips on hand cars.
(8)	Saving of one to three hours per man per day on carpenter gangs.	Yes. 10% to 15% greater.	Can get men to work quicker and in better condition for day's work. Disadvantage is delay in getting started in extreme cold weather.
(9)	Two sections of 9 mi. made one of 18 mi., saving 1 foreman, \$56, and 2 men, \$52; total, \$108 per mo. 19 superv. cars save 19 crank hands at \$1.25 per day, \$617.50 per mo. Superv. able to cover his territory 5 times as often as on crank car.	Yes.	Great improvement over hand cars in every way.
(10)	.....	.....	.....
(11)	Sections generally not lengthened.	Yes.	Motor cars enable us to obtain better class of labor; more frequent and better track inspection. Enable men to get to washouts, fires, etc., more promptly; save time and labor in distributing material. Men arrive in better shape for work. Estimate saving 1 hr. per day on every crew provided with a motor car.
(12)	Increased section length 4 miles. Save \$80 per section per month.	Yes.	Shortens time to and from work and men are in better condition to work when they arrive.
(13)	33 1/4 per cent.	Yes.	.....
(14)	Sections lengthened somewhat. On busy lines have found double track sections over 4 1/2-5 miles and single track sections over 8 miles not advisable.	Yes. Easier to get and hold men.	Principal difficulty with motor cars is unreliability. When a car is designed which is low in first cost, easy to maintain and reliable, railways will generally adopt it.
(15)	Have about doubled length of sections.	Yes.	Motor cars found very reliable. Decided advantage in procuring labor. Easier to maintain full section force. Men are landed on the job fresh, with a saving of a half hour in the morning and evening.
(16)	On busy track have lengthened sections 2 1/2 to 3 miles.	Yes.	Section men get out to work quicker and are in better condition to perform day's work.
(17)	One motor car to 2 sections, saving wages of 1 foreman, less maintenance and operation of the car.	Yes. 20% account of being able to transport men to and from work with less delay than with ordinary hand or push cars.	Owing to character of country through which road runs, few sections are adapted to motor car use, principally due to heavy grades, curves, cuts and snow troubles.
(18)	Five sections each lengthened 3 miles (about 40%). About 10% saved in labor account less time used in going to and from work and men not being fatigued from pumping. Save \$118 per mo. by eliminating 2 foremen.	Yes.	Men start work fresh and work up to quitting time instead of pumping home on company's time.
(19)	.....	Questionable.	.....
(20)	200% conservative estimate. Time saved bridge and track inspection.	Yes. Prejudice against motor cars among section forces arises because of prospective reductions of force. These reductions are usually too drastic to be economical.	Cars designed for different speeds more suitable for inspection, where frequent stops must be made, than one-speed cars.
(21)	Have not lengthened track sections but have avoided necessity of shortening some existing sections. Some maintainers' sections lengthened from 5 to 10 mi. Where cars are used a saving of about 30 min. per day per man is averaged.	Yes.	Considerable time saved. Efficiency increased. Have found cars reliable, and saving in time more than offsets cost of fuel, oil and repairs.
(22)	Lengthened track sections from 3 to 5 miles.	Yes.	Trackmen are able to patrol their track in shorter time than with hand cars, enabling them to devote more time to actual track work.
(23)	Sections not lengthened. Cars expedite inspection and give more time for track repairs. Signal maintainer's territory has been doubled.	Yes. Car is operated satisfactorily against strong winds and climbs grades at higher speed. In hilly and windy country use of motor increases efficiency of gangs 5% to 25%; average about 10%. Laborers will do that much more work.	Laborers arrive at work in fit condition. Employment on section is more attractive. 30 min. to 2 hr. saved daily in movement of gang. Assembling laborers in emergencies facilitated. Cars are reliable and engine failures are few.
(24)	Have not lengthened sections or territory. Bridge gangs do about 1/3 more work in a month by using motor car, with same amount of labor.	Yes.	.....
(25)	Have doubled sections, saving one section foreman's wages for each car.	Yes.	Men go home on own time, giving company benefit of full day's work, and are not fatigued on arrival at work from pumping.
(26)	Track sections lengthened 1 to 6 mi... depending on 2 foremen but increase rate about 15%. No reduction in number of laborers.	Yes.	Cars have proved reliable.
(27)	Sections increased 50%. Reduction in labor expense about 25%.	Yes.	Converted hand cars not altogether reliable. Operate in one direction only.
(28)	From 20% to 100%. In 75% of installations sections have been doubled.	Yes.	Motor cars useful in maintaining sections where labor cannot be secured locally.
(29)	.....	Yes.	At present are using motor cars on long sections on divisions where traffic is light.
(30)	Sections can be lengthened from 8 to 10 or 12 mi., a saving of about 10%.	Yes.	Use of cars on this road still experimental.
(31)	Trying 6 to 11 mi. sections. Signal department saves about 50% in wages by giving men long territory.	.....	.....
(32)	Sections not lengthened on main line; lengthened 33 1/3% to 100% on branches. Maintainer's territory lengthened 25%.	Yes. Efficiency of bridge gangs increased 30% to 50%.	.....
(33)	Sections lengthened 50% to 70%. Saving in labor 10% to 15%. Maintainer's estimated saving in labor 30%.	Yes.	Cars not suitable for mountain sections and should not be used on main line where curvature is heavy and view obstructed.
(34)	No increase in section or maintainer's district lengths. Many signals added without increase in number of maintainers. Saving estimated at 15%.	Yes.	Extra gangs can be handled at much less expense than by work train.
(35)	Signal department cars used by supervisors, not maintainers.	Yes.	Cars out of service 15% of time.
(36)	From an average of 6 1/2 to 12 mi. at a saving for section foremen of \$770 per month.	Yes.	.....
(37)	Sections not lengthened.	Yes.	.....
(38)	11 sections made into 7; saving wages of 4 foremen and in winter 8 laborers also.	Yes.	Water service gangs cover more territory and do it better, often avoiding moving outfit cars.
(39)	By use of section motor cars we have been able to increase length of sections from 7 to 12 mi., dispensing with services of about 27 foremen.	Yes.	.....
(40)	Have been able to consolidate 2 sections in some cases, saving cost of one gang and a foreman. Where the section was already long we have been able to save half a gang.	It has been found easier to retain men where motor cars are used.	The saving effected over hand cars has been found to pay the cost of a motor car in a year or less.
(41)	.....	Would be unable to handle signal maintaining work with present force without motor cars.	Bridge superintendent uses car listed under bridge gangs.

Track sections average 10 miles.  
Have not extended sections or maintainer's territory. Average saving of 21 hr. 14 min. per car

Yes.

Yes.

Use car to advantage for distributing and transfer-

(5) Boston & Albany.....	4	F. M. Co.	6 mos.	About 45c. per mo. Minor repairs made by foreman, others by supervisor.	\$1.33 per 100 mi. Cars make 350 to 400 mi. per mo.
(6) Boston & Maine.....	56	40 F. M. Co. 16 Rockford	35-1 yr., 21-6 mos.	Insp. repairs troubles which foremen cannot repair.	76c. per 100 mi.
(7) Buffalo, Rochester & Pittsburgh.....	1	F. M. Co.	6 mos.	Cars looked after by road-masters.	\$1.60 per 100 mi.
(8) Central New England Ry.....	...	...	...	...	...
(9) Central of Georgia Ry.....	3	F. M. Co.	1-3 mos., 2-1 mo.	...	...
(10) Central Vermont Ry.....	...	...	...	...	...
(11) Chicago & North Western.....	267	9 F. M. Co., 142 Waterloo, 94 Fairmont, 22 Misc.	Average 1 yr.	45c. per month.	\$2.25 per mo.
(12) Chicago Great Western.....	142	F. M. Co. and Rockford.	26-15 mos., 34-2½ yrs., 49-2 yrs., 33-16 mos.	Average \$2.95 per month.	Average \$2.52 per mo.
(13) Chicago, Milwaukee & St. Paul.....	48	F. M. Co., Duntley and Rockford.	1 to 4 yrs.	\$2 to \$10 per mo. Light repairs made on line, heavy repairs in shop.	\$2 per 100 mi.
(14) Chicago, Minneapolis & St. Paul.....	295	Various makes.	Various periods; some cars several years.	Record discontinued.	Record discontinued.
(15) Cleveland, Cincinnati, Chic. & St. L.....	57	41 F. M. Co., 8 Rockford, 8 Buda.	About 1 yr.	Average \$0.88 per mo. Repair parts ordered from mfrs.; repair work done by our men.	20 mi. per gal. of gasoline. 86c. per 100 mi.
(16) Colorado & Southern.....	21	F. M. Co.	1 to 2 yrs.	Repairs made by company's shops.	\$4 per 100 mi.
(17) Colorado Midland .....	5	F. M. Co.	2½ yrs.	Light repairs made by foreman in charge. Cost included in operation.	\$1.50 per 100 mi.; including lubric. oil and repairs.
(18) Cumberland Valley R. R.....	5	F. M. Co.	9 mos.	Kept in repair by our shops.	\$4 per mo.
(19) Delaware & Hudson.....	1	F. M. Co.	15 mos.	\$2 per month.	\$1.25 per 100 mi.
(20) Duluth, South Shore & Atlantic.....	...	...	...	...	...
(21) Erie R. R.....	45	4 F. M. Co., 38 Rockford, 3 Buda.	2 mos. to 5 yrs.; average 18 mos.	\$1 per mo. Kept by signal maint. and section men.	\$1.15 per 100 mi.
(22) Grand Rapids & Indiana.....	18	10 F. M. Co., 3 Rockford, 5 Converted Hand Cars.	Average 2½ yrs.	...	\$4.40 per mo., or \$1 per 100 mi.
(23) Great Northern Ry.....	254	144 Fairmont, 75 Waterloo, 35 Miscellaneous.	211 cars less than 12 mos.: 37 cars 1 to 2 yrs.; 6 cars more than 2 yrs.	Light repairs by traveling experts and foremen; heavy repairs at car shop. 192—under \$0.50 per mo., 59—\$0.50 to \$1 per mo., 3—over \$1 per mo.	66—\$1 to \$2 per mo.; 104—\$2 to \$3 per mo.; 78—\$3 to \$4 per mo.; 6—over \$4 per mo.
(24) Kanawha & Western.....	1	Rockford.	6 mos.	Each foreman keeps own car in repair; ordering the necessary parts.	...
(25) Lake Erie & Western.....	21	7 Rockford, 14 F. M. Co.	1 to 3 yrs.	Repairs by shops and local repairmen; \$1.84 per mo.	68c. per 100 mi.
(26) Lake Shore & Michigan Southern....	44	F. M. Co., Buda.	6 mos. to 1 yrs.	...	...
(28) Minneapolis & St. Louis.....	10	7 Rockford, 5 F. M. Co.	...	...	100 mi.
(29) Missouri, Kansas & Texas.....	88	Waterloo, Fairmont and F. M. Co.	3 mos.	\$3.50 per mo. Motor car inspector on each district. Damaged cars sent to shop.	\$1.80 per mo.
(30) Missouri Pacific .....	275	180 F. M. Co., 70 Rockford, 25 Miscellaneous.	219-1 yr., 53-2 yrs., 1-3 yrs., 1-4 yrs., 1—over 4 yrs.	\$0.88 per 100 mi. Repairman makes light repairs; heavy repairs at the shops.	71c. per 100 mi.
(31) Nashville, Chattanooga & St. Louis..	6	F. M. Co.	1-2 yrs., 1-4 mos., 1-14 mos., 2 just installed.	...	\$1.80 per mo., including batteries.
(32) New Orleans, Mobile & Chicago.....	14	F. M. Co. and Rockford.	1 to 5 yrs.	...	\$2 per mo.
(33) New York Central & Hudson River..	16	13 F. M. Co., 3 Ry. Supply Co.	15—new, 1-2 yrs.	\$1 per 100 mi.	...
(34) Norfolk & Western.....	36	21 F. M. Co., 7 Rockford, 8 Buda.	6 mos. to 3 yrs.	\$2.08 per mo.	\$3.44 per mo.
(35) Northern Pacific .....	122	40 F. M. Co., 7 Rockford, 2 Uhler, 3 Duntley, 45 Waterloo, 1 Buda, 23 Fairmont, 1 Detroit.	Maximum 3 yrs.; average 10 mos.	Probably \$1.50 per mo. Light repairs by foreman; heavy repairs at shop.	60c. to 80c. per 100 mi.
(36) Oregon-Washington R. R. & Nav....	14	11 F. M. Co., 3 Waterloo	10-21 mos.; 3-3 mos., 1-9 mos.	\$3.72 per mo. Repairs at shops.	\$3.50 to \$4.5 per mo.
(37) Pittsburgh & Lake Erie.....	3	F. M. Co.	Average 9 mos.	...	62c. to 92c. per 100 mi.
(38) Saint Joseph & Grand Island.....	19	18 Uhler, 1 F. M. Co.	6 mos.	\$1.10 per mo.	\$1.49 per mo.; 25c. per 100 mi.
*(38a) St. Louis & San Francisco.					
(39) San Pedro, Los Angeles & Salt Lake— Los Angeles Division.....	6	F. M. Co.	1 yr.	Maintained by M. W. Dept.	\$1.25 per 100 mi.
Salt Lake Division.....	8	F. M. Co.	1½ yrs.	94c. per mo. Water service men keep all cars repaired.	Gasoline, 86c. per 100 mi.; Oil, \$1.24 per 100 mi.
(40) Southern Railway .....	35	30 F. M. Co., 1 Buda, 4 Rockford.	Maximum 3 yrs.	Average \$3 per mo.	Average \$ per mo.
(41) Southern Pacific .....	33	30 F. M. Co., 3 Buda.	Average 13 mos.	Average \$1.46 per mo.	Average \$1.0 per 100 mi.
(42) Spokane, Portland & Seattle.....	...	...	...	...	...
(43) Sunset-Central Lines— Houston & Texas Central.....	4	F. M. Co.	2 yrs.	\$0.40 per mo.	\$1 per 100 mi.
Texas & New Orleans.....	5	F. M. Co.	3 yrs.	\$9.44 per mo. Repairs made in signal repair shop.	\$1.66 per mo.
Louisiana Lines .....	12	F. M. Co.	1 yr. 9 mos.	Average \$0.36 per mo.	Average \$2.91
E. P. ....	6	F. M. Co.	1-½ yr.	...	80c. per mo.
Victoria Division .....	6	F. M. Co.	3 yrs.	\$2.20 per mo.	\$3.89 per mo.
G. H. & S. A.—Houston Division..	3	F. M. Co.	1-5 yrs., 2-3 yrs.	\$4 per mo. Repairs at motor car repair shop.	\$4 per mo.
(44) Terminal R. R. Ass'n of St. Louis..	3	F. M. Co.	3 yrs.	Approx. \$1.50 per mo.	Approx. \$ per mo.
(45) Trinity & Brazos Valley.....	...	...	...	...	...
(46) Union Pacific .....	47	32 F. M. Co., 5 Buda, 10 Rockford, Rockford.	Maximum 5 yrs.	\$1.25 per 100 mi.	58c. per 100 mi.
(47) Vandalia .....	11	...	6 mos.	...	3,4381 gal. of gasoline per 100 mi.; 51 per 100 mi.

NOTE.—The following abbreviations are used in the table for the makers of cars: F. M. Co.—Fairbanks, Morse & Co., Chicago. Rockford—Chicago Pneumatic

\*Data were received from the St. Louis & San Francisco too late for incorporation in this table. Detail data concerning the operation of motor cars on that road

i. Cars mi. per	(5) ..	.....	.....	.....	.....	.....	.....	.....	.....
mi.	(6) ..	.....	.....	.....	2	1 F. M. Co. 1 Buda.	1—4 yrs. 1—2 yrs.	Repaired by em- ployee operating car.	.....
mi.	(7) ..	.....	.....	.....	.....	.....	.....	.....	.....
...	(8) 6 F. M. Co. and Rockford.	4 mos.	.....	90c. per 100 mi.	2	F. M. Co. and Rockford.	3 mos.—F. M. Co. 10 mos.—Rockf'd.	.....	90c. per 100 mi.
...	(9) ..	.....	.....	.....	.....	.....	.....	.....	.....
...	(10) ..	.....	.....	.....	.....	.....	.....	.....	.....
...	(11) 18 3 F. M. Co., 6 Fair- mont, 7 Waterloo, 2 Rockford.	Av. 1½ yrs.	.....	\$1.80 per mo.	30	11 Adams, 8 Rock- ford, 5 F. M. Co., 4 Fairmont, 2 Mis.	Av. 2½ yrs.	75c. per mo.	\$2.78 per mo.
...	(12) 15 F. M. Co. and Rockford.	5—11 mos. 5—2 yrs. 5—8 mos.	Av. \$2.65 per mo.	Av. \$2.32 per mo.	15	F. M. Co. and Rockford.	10—25 mos., 1— 2½ yrs., 3—2 yrs., 1—9 mos.	Av. \$4.58 per mo. Av. \$3.11 per mo.	.....
...	(13) 13 ..	.....	.....	.....	18	.....	.....	.....	.....
...	(14) 127 Various makes.	Various periods.	Record discontinued.	Record discontinued.	8	Various makes.	.....	Record discontinued.	.....
...	(15) ..	.....	.....	.....	.....	.....	.....	.....	.....
...	(16) 8 F. M. Co.	1 to 2 yrs.	.....	\$4 per 100 mi.	..	.....	.....	.....	.....
...	(17) ..	.....	.....	.....	..	.....	.....	.....	.....
...	(18) ..	.....	.....	.....	1	F. M. Co.	10 mos.	Kept in repair by our shops.	.....
...	(19) ..	.....	.....	.....	3	F. M. Co.	2 yrs.	\$1.30 per mo.	\$2.36 per mo.
...	(20) ..	.....	.....	.....	..	.....	.....	.....	.....
...	(21) 4 1 Buda, 3 Rockford	2—2 mos. 2—3 yrs.	\$1 per mo. Kept by operator.	\$1 per 100 mi.	24	10 Buda, 7 F. M. Co., 3 Rockford, 4 made in comp. shops.	6 mos. to 6 yrs. Average 3 yrs.	75c. per mo. Kept by signal main- tainer.	75c. per 100 mi.
...	(22) ..	.....	.....	.....	..	.....	.....	.....	.....
...	(23) 3 1 Fairmont, 1 Waterloo, 1 Misc.	2 cars less than 12 mos.; 1 car 1 to 2 yrs.	Under 50c. per mo.	\$1 to \$2 per mo.	9	3 Buda, 6 Mudge-Adams.	2—less than 12 mo. 3—1 to 2 yrs. 4—more than 2 yr.	3—\$1 to \$1 mo. 6—over \$1 mo.	\$1 to \$2 per mo.
...	(24) 2 Rockford.	1—6 mos. 1—18 mos.	.....	.....	1	Buda.	5 mos.	.....	.....
...	(25) 1 F. M. Co.	2 yrs.	36c. per mo.	93c. per 100 mi.	1	Adams.	3 mos.	.....	50c. per 100 mi.
...	(26) ..	.....	.....	.....	61	F. M. Co. Buda.	1 to 8 yrs.	\$1.25 per mo.	80c. per 100 mi.
...	(27) ..	.....	.....	.....	..	.....	.....	.....	.....
...	(28) ..	.....	.....	.....	..	.....	.....	.....	.....
...	(29) 4 Fairmont, Waterloo, F. M. Co.	3 mos.	.....	\$2.15 per mo.	..	.....	.....	.....	.....
...	(30) 29 19 F. M. Co. 8 Rockford, 2 Miscellan.	23—1 yr. 5—2 yrs. 1—3 yrs.	\$2.21 per 100 mi.	85c. per 100 mi.	9	F. M. Co.	1—2 yr., 3—3 yrs., 1—4 yr., 4—over 4 yr.	.....	.....
...	(31) ..	.....	.....	.....	1	F. M. Co.	2½ yrs.	.....	\$1.80 per mo., in- cluding batteries.
...	(32) 2 F. M. Co. and Rockford.	1—1 yr. 1—8 mos.	.....	.....	..	.....	.....	.....	.....
...	(33) ..	.....	.....	.....	2	Buda.	1—new, 1—2 yrs.	50c. per 100 mi.	.....
...	(34) 4 3 F. M. Co., 1 Buda.	1 yr.	.....	\$3.50 per mo.	69	54 F. M. Co., 15 Buda.	1 yr. to 7 yrs.	\$3.23 per mo.	\$4.90 per mo.
...	(35) 2 1 Waterloo, 1 F. M. Co.	1—1 yr. 1—3 yrs.	Approx. \$1 per mo.	52c. to 68c. per 100 mi.	35	26 Buda, 6 Rockford, 3 F. M. Co.	3 yrs. and less.	Repairs made by maintainers.	\$3.10 per mo.
...	(36) ..	.....	.....	.....	15	11 Adams-Mudge, 3 F. M. Co., 1 Buda.	11—2 yrs. 6 mos. 3—2 yrs. 7 mos. 1—1 yr. 1 mo.	Av. 61c. per mo. Repairs by sig- nal maintainers.	2 gal. per 100 mi. or \$4 per mo.
...	(37) ..	.....	.....	.....	2	F. M. Co.	5 yrs.	Repairs made by men in charge.	30c. per 100 mi.
...	(38) ..	.....	.....	.....	..	.....	.....	.....	.....
...	(39) ..	.....	.....	.....	..	.....	.....	.....	.....
...	(40) ..	.....	.....	.....	6	5 F. M. Co., 1 Buda.	Max. 2 yrs.	.....	.....
...	(41) 1 Rockford.	2 yrs.	.....	.....	..	.....	.....	.....	.....
...	(42) 1 Buda. (See Remarks)	30 mos.	Av. per mo. \$2.	30c. per 100 mi.	1	Buda.	30 mos.	Av. \$2 per mo.	30c. per 100 mi.
...	(43) 3 F. M. Co.	2—2 yrs. 1—1 yr.	.....	\$1.20 per 100 mi.	..	.....	.....	.....	.....
...	..	.....	.....	.....	4	2 F. M. Co.,	5 yrs.	\$4.50 per mo.	\$5 per car per mo.
...	..	.....	.....	.....	9	8 F. M. Co., 1 Rockford.	3 yrs.	.....	.....
...	2 F. M. Co. 1 F. M. Co.	2½ yrs. 5 yrs.	\$3.81 per mo. \$2 per mo.	\$3.74 per mo. \$4 per mo.	..	.....	.....	.....	.....
...	1 F. M. Co.	5 yrs.	.....	.....	6	F. M. Co.	5 yrs.	\$5 per mo.	\$3 per mo.
...	(44) 2 1 Buda, 1 F. M. Co.	1—8 mos. 1—3 yrs.	.....	Approx. \$5 per mo.	..	.....	.....	.....	.....
...	(45) 1 F. M. Co.	6 yrs.	\$1 per 100 mi.	\$2 per 100 mi.	..	.....	.....	.....	.....
...	(46) ..	.....	.....	.....	13	9 Buda, 4 F. M. Co.	6 or 7 yrs.	.....	17c. per 100 mi.
...	(47) ..	.....	.....	.....	..	.....	.....	.....	.....

Automatic Tool Co., Chicago. Buda—The Buda Co., Chicago. Waterloo—Associated Mfg. Co., Waterloo, Iowa. Fairmont—Fairmont Machine Co., Fairmont, Minn. That road will be found in a smaller table in the article. The number of such cars in service is: Section, 26; bridge gang, 20; signal maintainers, 30; inspection, 13; miscellaneous, 10.

		and Rockford.		keeps car in repair.						mass carper car looked after by signal repair- men.		
	(5) Boston & Albany.....											
.....	(6) Boston & Maine.....	3	1 F. M. Co. 2 Rockford.	1—3 yrs. 2—1½ yrs.	Repaired by employee operating car. Cars looked after by roadmasters.							
.....	(7) Buff., Roch. & Pittsb..	2	F. M. Co.	9 mos.		\$1.25 per 100 mi.	1	Fairb.-M.	6 mos.	Repairs by roadmasters.	\$1.75 for gang car trailer 100 m.	
90c. per 100 mi.	(8) Central New Eng. Ry..	2	F. M. Co. and Rockford.	3 yrs.—Rockf.		90c. per 100 mi.	...	...	...			
.....	(9) Central of Georgia Ry.	21	F. M. Co.	2 to 3 mos.	38c. per mo.	\$3.68 per mo.	...	...	...			
.....	(10) Central Vermont Ry...	1	F. M. Co.	4 yrs.	\$64.52. Gen- eral repairs at factory.	40c. per 100 mi.	...	...	...			
\$2.78 per mo.	(11) Chicago & Nor. West'n	23	2 Rockford. 16 F. M. Co. 2 Adams. 2 Duntley. 1 Waterloo.	Av. 5 yrs.	45c. per mo.	\$2.90 per mo.	11	5 Fairb.-M. 3 Fairmont. 2 Adams. 1 Rockford.	Av. 2 yrs.	52c. per mo.	\$3 per	
.....	(12) Chicago Gt. Western..	16	F. M. Co. and Rockford.	4—2½ yrs. 5—2½ yrs. 2—2 yrs. 5—2½ yrs.	Av. \$2.03 per mo.	Av. \$2.06 per mo.	8	Fairb.-M. and Rockford.	2—2 yrs. 2—2½ yrs. 3—2 yrs. 1—2½ yrs.	Av. \$2.70 per mo.	Av. \$2 per m.	
.....	(13) Chicago, Mil. & St. P. (Puget Sd. Lines.)	3	.....	.....	.....	.....	16	.....	.....	.....	.....	
Record discontinued.	(14) Chicago, Minn. & St. P.	...	.....	.....	.....	.....	26	Various makes.	.....	Record discontinued.	.....	
.....	(15) C., C., C. & St. L....	...	.....	.....	.....	.....	...	...	...	.....	.....	
.....	(16) Colorado & Southern..	6	F. M. Co. and Rockford.	1 to 3 yrs.	.....	\$4 per 100 mi.	2	.....	1 to 3 yrs.	.....	\$4 per 10	
.....	(17) Colorado Midland....	1	Converted Automobile.	3 yrs.	.....	\$2 per 100 mi. Including lub. oil and repairs.	...	.....	.....	.....	.....	
.....	(18) Cumberland Val. R. R.	1	F. M. Co.	3 mos.	Kept in repair by our shops.	.....	...	.....	.....	.....	.....	
.....	(19) Delaware & Hudson...	2	1 Buda, 1 F. M. Co.	2 yrs.	\$1.25 per mo.	80c. per 100 mi.	...	.....	.....	.....	.....	
.....	(20) Duluth, So. Shore & A.	4	2 F. M. Co. 2 Buda.	1 yr.	\$9 total; labor only. One man cares for all cars.	\$1.12 per 100 mi.	...	.....	.....	.....	.....	
per mo. Kept signal main- tainer.	(21) Erie R. R.....	30	10 Buda. 16 F. M. Co. 4 Rockford.	4 mo. to 6 yr. Av. 18 mos.	\$1 per mo. Kept by signal maintainer.	\$1 per 100 mi.	10	3 F. M. Co. 1 Rockford. 4 Buda. 2 Erie.	1 mo. to 7 yrs. Av. 18 mo.	\$1 per mo.; kept by signal maint.	\$1 per 100	
.....	(22) Grand Rapids & Ind..	...	.....	.....	.....	.....	2	.....	.....	.....	.....	
40c. to \$1 mo. over \$1 mo.	(23) Great Northern Ry....	35	1 Buda. 16 Mudge-Ad. 11 F. M. Co. 7 Misc.	11—less than 12 mos. 6—1 to 2 yr. 18—over 2 yr.	25 under 50c. per mo. 9—50c. to \$1 mo. 1—over \$1 mo.	17—\$1 to \$2 mo. 9—\$2 to \$3 mo. 9—over \$4 mo.	11	5 F. M. Co. 3 Mudge-Ad. 3 Misc.	1—less than 12 mos. 3—1 to 2 yrs. 7—over 2 yrs.	4—under 50c. 7—50c. to \$1 mo.	8—\$1 to \$2 1—\$2 to \$3 2—\$3 to \$4	
50c. per 100 mi.	(25) Lake Erie & Western..	1	F. M. Co.	18 mos.	.....	.....	...	.....	.....	.....	.....	
25 per mo.	(26) Lake Shore & Mich. S.	25	F. M. Co.	5 to 12 yrs.	\$1.25 per mo.	70c. per 100 mi.	3	1 Rockford. 1 F. M. Co. 1 built by roadmaster	2 yrs.	\$1.84 per mo.	68c. per 100 m.	
.....	(28) Minneapolis & St. L...	...	.....	.....	.....	.....	...	.....	.....	.....	.....	
.....	(29) Missouri, Kan. & Tex.	17	F. M. Co.	6 mo. to 2 yr.	80c. per 100 mi.	.....	...	.....	.....	.....	.....	
.....	(30) Missouri Pacific .....	16	F. M. Co.	6—2 yrs. 10—3 yrs.	\$1.47 per 100 mi.	93c. per 100 mi.	34	25 F. M. Co. 3 Rockford. 6 Miscel.	8—1 yr; 1—2 yr; 5—3 yr; 4—4 yr; 16—over 4 yr.	.....	.....	
\$1.80 per mo., in- cluding batteries.	(31) Nash., Chat. & St. L..	2	F. M. Co.	1—1 yr. 1—2½ yrs.	.....	\$1.80 per mo., including batteries.	...	.....	.....	.....	.....	
.....	(32) New Orl., Mobile & C.	2	F. M. Co.	8 mos.	.....	.....	1	.....	.....	.....	.....	
per 100 mi.	(33) N. Y. Cen. & H. R....	44	F. M. Co.	Av. 7 yrs.	Av. about 80c. per 100 mi.	.....	6	2 Buda. 4 F. M. Co.	5—less than 2 yrs.	50c. to \$1 per 100 mi.	.....	
23 per mo.	\$4.90 per mo.	.....	.....	.....	.....	.....	...	.....	.....	.....	.....	
airs made by maintainers.	\$3.10 per mo.	.....	.....	.....	.....	.....	...	.....	.....	.....	.....	
61c. per mo. 2 gal. per 100 mi., pairs by sig- mantainers.	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	.....	
airs made by in charge.	30c. per 100 mi.	.....	.....	.....	.....	.....	...	.....	.....	.....	.....	
.....	(35) Northern Pacific .....	21	5 Rockford. 2 Duntley. 6 Buda. 8 F. M. Co.	Max. 4 yrs. Av. 2 yrs.	75c. per mo.	52c. to 95c. per 100 mi.	1	F. M. Co.	19 mos.	.....	52c. per 100 mi.	
.....	(36) Ore.-Wash. R. R. & N.	1	F. M. Co.	3 yrs.	\$1.25 per mo. Repairs by shop men.	\$1.15 per mo.	...	.....	.....	.....	.....	
.....	(37) Pittsburgh & Lake Erie	2	.....	1—1 mo. 1—10 mos.	.....	42c. per 100 mi.	2	F. M. Co.	.....	.....	.....	
.....	(38) St. Joseph & Grand Isl.	...	.....	.....	.....	.....	...	.....	.....	.....	.....	
.....	(39) San P., L. A. & S. L.— Los Angeles Div....	4	F. M. Co.	10 yrs.	.....	50c. per 100 mi.	2	1 Buda. 1 built in shop	1 yr.	.....	\$1.75 per 100 mi.	
.....	.....	7	3 F. M. Co. 4 Buda.	1¾ to 8 yrs.	.....	About 30 mi. per gal.	2	1 F. M. Co. 1 built in shop	2½ yrs.	.....	About 80 per gal.	
.....	(40) Southern Railway.....	16	9 F. M. Co. 6 Buda. 1 Con. Form & Eng. Co.	Max. 7 yrs.	.....	.....	...	.....	.....	.....	.....	
.....	(41) Southern Pacific .....	...	.....	.....	.....	.....	...	.....	.....	.....	.....	
\$2 per mo.	30c. per 100 mi.	(42) Spokane, Port. & Seattle	5	F. M. Co.	2—4 yrs. 1—1 yr.	45c. per 100 mi.	...	.....	.....	.....	.....	
.....	(43) Sunset-Central Lines— Houston & Tex. Cen. Texas & New Orl...	1	F. M. Co.	1½ yrs.	.....	.....	...	.....	.....	.....	.....	
30 per mo.	\$5 per car per mo.	.....	Louisiana Lines	4	F. M. Co.	.....	2	F. M. Co.	.....	.....	.....	
.....	E. P. ....	...	.....	.....	.....	.....	1	F. M. Co.	2 yrs.	.....	30c. per	
.....	\$3 per mo.	.....	Victoria Division....	3	F. M. Co.	3 yrs.	\$1.60 per mo.	4	F. M. Co.	1—3 yr; 1—2 yr; 2—2½ yrs.	\$2.80 per mo.	\$4.80 per
.....	.....	.....	G. H. & S. A.—H. Div.	2	F. M. Co.	1—3 yrs. 1—5 yrs.	\$2 per mo.	6	F. M. Co.	2—5 yrs. 4—3 yrs.	\$2 per mo.	\$2 per m.
.....	.....	.....	(44) Ter. R. R. As. of St. L.	...	.....	.....	.....	...	.....	.....	.....	
17c. per 100 mi.	(45) Trinity & Brazos Val..	3	2 Adams. 1 F. M. Co.	1—6 mos. 2—1½ yrs.	Av. 66c. per 100 mi.	Av. 66c. per 100 mi.	...	...	.....	.....	.....	
.....	(46) Union Pacific.....	1	F. M. Co.	7 yrs.	.....	.....	7	F. M. Co.	7 yrs.	.....	.....	
.....	(47) Vandalia .....	...	.....	.....	.....	.....	...	.....	.....	.....	.....	

### 30: inspection,

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75 for extra  
car and  
trailer per  
100 mi.

\$3 per mo.

Av. \$2.19  
per mo.

per 100 mi.

\$1 to \$2 mo.  
\$2 to \$3 mo.  
\$3 to \$4 mo.

68c. per  
100 mi.

52c. per  
100 mi.

\$1.75 per  
100 mi.  
about 80 mi.  
per gal.

Saving in cost of labor is necessary to justify use of motor cars on ordinary grades.

proven too light for large gangs on 0.8 per cent. grade.

(5) Sections increased from 5 to 6 mi. to 10 to 12 mi. with annual saving of \$3,502.14, against which is first cost of motor cars, gasoline, storage tanks, etc., equal to \$884.81.

(6) Double length of sections and in most cases dispense with services of one foreman.

(7) Section not lengthened.

(8) Saving of one to three hours per man per day on carpenter gangs.

(9) Two sections of 9 mi. made one of 18 mi., saving 1 foreman, \$56, and 2 men, \$52; total, \$108 per mo. 19 superv. cars save 19 crank hands at \$1.25 per day, \$617.50 per mo. Superv. able to cover his territory 5 times as often as on crank car.

(10) Sections generally not lengthened.

(11) Increased section length 4 miles. Save \$80 per section per month.

(12) 33 1/3 per cent.

(13) Sections lengthened somewhat. On busy lines have found double track sections over 4 1/2-5 miles and single track sections over 8 miles not advisable.

(14) Have about doubled length of sections.

(15) On busy track have lengthened sections 2 1/2 to 3 miles.

(16) One motor car to 2 sections, saving wages of 1 foreman, less maintenance and operation of the car.

(17) Five sections each lengthened 3 miles (about 40%). About 10% saved in labor account less time used in going to and from work and men not being fatigued from pumping. Save \$118 per mo. by eliminating 2 foremen.

(18) 200% conservative estimate. Time saved bridge and track inspection.

(19) Have not lengthened track sections but have avoided necessity of shortening some existing sections. Some maintainers' sections lengthened from 5 to 10 mi. Where cars are used a saving of about 30 min. per day per man is averaged.

(20) Lengthened track sections from 3 to 5 miles.

(21) Sections not lengthened. Cars expedite inspection and give more time for track repairs. Signal maintainer's territory has been doubled.

(22) Have not lengthened sections or territory. Bridge gangs do about 1/3 more work in a month by using motor car, with same amount of labor.

(23) Have doubled sections, saving one section foreman's wages for each car.

(24) Track sections lengthened 1 to 6 mi., depending on 2 foremen but increase rate about 15%. No reduction in number of laborers.

(25) Sections increased 50%. Reduction in labor expense about 25%.

(26) From 20% to 100%. In 75% of installations sections have been doubled.

(27) Sections not lengthened.

(28) 11 sections made into 7; saving wages of 4 foremen and in winter 8 laborers also.

(29) By use of section motor cars we have been able to increase length of sections from 7 to 12 mi., dispensing with services of about 27 foremen.

(30) Have been able to consolidate 2 sections in some cases, saving cost of one gang and a foreman. Where the section was already long we have been able to save half a gang.

(31) Track sections average 10 miles.

(32) Have not extended sections or maintainer's territory. Average saving of 21 hr. 14 min. per car per month.

(33) Track sections average 6.4 mi.; saving in labor per mo., 13 cars, \$534.29. Signal maintainer's saving in labor per mo., \$105.

(34) Sections not lengthened. \$13.85 saved in time going to and coming from work by use of motor car during month.

(35) Maintainer's territories have been increased from 15 to 26 mi. and salaries increased from \$75 to \$90 per mo.

(36) Have not lengthened sections but get our men to work 10 hrs. per day.

(37) See article in *Railway Age Gazette*, March 15, 1912.

(38) Sections have been increased from an average of 5.8 mi. to 9.3 mi., a saving of the salaries of six section foremen.

(39) Men are able to do more and better work in addition to the saving in time effected.

(40) Yes. 10% to 15% greater.

(41) Yes.

(42) Yes.

(43) Yes.

(44) Yes.

(45) Yes.

(46) Frost makes car slip. Has to be pushed like hand car. After train has passed motor car travels all right.

(47) Motor inspection cars make better supervision possible at considerably reduced cost over old method of making inspection trips on hand cars.

(48) Can get men to work quicker and in better condition for day's work. Disadvantage is delay in getting started in extreme cold weather.

(49) Great improvement over hand cars in every way.

(50) Motor cars enable us to obtain better class of labor; more frequent and better track inspection. Enable men to get to washouts, fires, etc., more promptly; save time and labor in distributing material. Men arrive in better shape for work. Estimate saving 1 hr. per day on every crew provided with a motor car.

(51) Shortens time to and from work and men are in better condition to work when they arrive.

(52) Principal difficulty with motor cars is unreliability. When a car is designed which is low in first cost, easy to maintain and reliable, railways will generally adopt it.

(53) Motor cars found very reliable. Decided advantage in procuring labor. Easier to maintain full section force. Men are landed on the job fresh, with a saving of a half hour in the morning and evening. Section men get out to work quicker and are in better condition to perform day's work.

(54) Owing to character of country through which road runs, few sections are adapted to motor car use, principally due to heavy grades, curves, cuts and snow troubles.

(55) Men start work fresh and work up to quitting time instead of pumping home on company's time.

(56) Questionable.

(57) Yes. Prejudice against motor cars among section forces arises because of prospective reductions of force. These reductions are usually too drastic to be economical.

(58) Yes.

(59) Yes.

(60) Yes.

(61) Yes.

(62) Yes.

(63) Yes.

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(169) Yes.

(170) Yes.

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(186) Yes.

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# MOTOR CARS FOR MAINTENANCE OF WAY FORCES.

A Study of the Service of Over Thirty-five Hundred Cars  
on Sixty Roads. General Satisfaction Where Properly Used.

[WITH AN INSET.]

The use of motor cars in the maintenance of way department has spread so rapidly in the last two years that it is felt that a summary of the results being secured with these cars at present will be of even greater interest than was the similar resume which was published in the *Railway Age Gazette* of May 19, 1911. In compiling the first table, inquiries were sent to all roads over 500 miles in length. The replies which were received from practically all these roads showed 31 that were using motor cars for section and bridge gangs, or for inspection service in the maintenance department. Inquiries were sent out this year to a larger number of roads, and while it is certain that the replies do not cover all roads using motor cars, it is probable that the 48 replies tabulated in the accompanying table include those which have had the longest and most general experience with such cars. In addition to these 48 roads, replies were received from 15 others on which some motor cars are in service but which, for various reasons, could not furnish the complete data requested.

Among the latter the Canadian Pacific has two section cars in use for experimental purposes and reports that they operate very satisfactorily in the summer, but with some difficulty during the extreme cold weather. The Chicago & Alton is experimenting with 10 section cars, but has not had them in service long enough to report the cost of repairs and operation and the resulting economy to be secured from their use. The Chicago, Burlington & Quincy also has a number of cars in service, but has not collected complete data. The Chicago, Rock Island & Pacific, which was shown in the earlier table as having 116 cars in service, has even a larger number in use at present, and this company is making elaborate experiments on cars of various makes. These tests are not yet complete, however. The El Paso & Southwestern is experimenting with section cars and is increasing the section lengths on the Tucson extension to 15 miles. This experiment is just beginning and no data is yet available. The only use of motor cars on the Grand Trunk is for periodical bridge inspection. The Illinois Central is known to be making a very careful study of motor cars and has many already in use but until a final report on the present experiments is made no information is available. The Kansas City Southern has one section car and two roadmasters' inspection cars, but no cost data has been kept. The Maine Central has one car.

The Pennsylvania Railroad is experimenting with motor cars for section gangs and other maintenance forces, but has not yet collected sufficient data to reach a conclusion. The Philadelphia & Reading has in use a few cars for its signal supervisors but reports that they have not been found very good for general use on that line. The Queen & Crescent has 30 cars, most of which have been in use a comparatively short time and there has been no opportunity to compile reliable data covering their service. The Rutland has two inspection cars which have been in service 11 and 13 years, respectively. No cost data has been kept. The Seaboard Air Line, which reported 30 section cars and 20 inspection cars in use in 1911, replies that this number has not been increased since that time and that very little can be added to their former report. The conclusions reached by this road are very favorable to the use of motor cars both in section and inspection service. The St. Louis Southwestern has made use of motor cars only for inspection by superintendents. The Virginian is just starting experiments with motor cars for section forces.

The total number of cars covered in the new table is 3,306, excluding over 200 cars referred to above, as compared with

1,536 shown in the previous compilation. While these figures are by no means complete, they furnish a good indication of the extent to which these cars have been adopted in the last two years. While, in comparing individual roads in the two tables, a number of apparent decreases are shown, it is doubtful if any of these are real. For instance, although the Santa Fe only shows 95 cars this year as against 174 in 1911, it should be noted that this year's report covers only the western lines as the data on other parts of the system was not available. The New York Central & Hudson River was shown in the 1911 table as having 149 cars in use. This should have been the New York Central system, however, and while the New York Central & Hudson River reports only 68 this year, the Pittsburgh & Lake Erie with nine, the Lake Shore & Michigan Southern with 134, the Lake Erie & Western with 27, and the Cleveland, Cincinnati, Chicago & St. Louis with 57, bring the total for the system up to 295. Somewhat similar confusion exists in the two reports for the Harriman lines. In 1911 the Union Pacific-Southern Pacific are shown as having 238 cars, while the separate reports for these two roads in this year's table show only 102 cars. However, the former report covered the entire system. Including the Oregon-Washington Railroad and Navigation Company and the Sunset lines in the present report the total is 216. This is still less than the 1911 figure, which is probably explained by the fact that reports were not received from some of the other lines of the system which were included in the general report in 1911.

Some of the most important increases in the number of cars in use are the following: The Chicago & North Western now has a total of 349 cars, and none were reported by this road in 1911. The table shows by the length of time these cars have been in service that with the exception of the inspection cars, almost all of them have been secured since the publication of the former article. The Chicago Great Western shows an increase from 77 to 196; the Chicago, Milwaukee and St. Paul from 316 to 554, the Erie from 31 to 113; and the Great Northern from 52 to 312. The Missouri Pacific, which was not reported in 1911, now has 363 cars, of which only 52 have been in service two years or more, as shown by the detailed report. The Northern Pacific presents a similar case, reporting this year 181 cars, of which only a few were in service in 1911.

There is no longer any question as to the value of motor cars in the maintenance of way department. Practically every road using them reports some economy resulting from their use, the amount and character of the savings depending somewhat on local conditions. The replies received to the 1913 inquiries do not bring out many advantages not mentioned in 1911, but it is noticeable that a much more widely extended use of these cars has not brought out any important disadvantages, and all of the advantages mentioned in the 1911 returns are repeated and emphasized this year.

In brief, the arguments in favor of motor cars in section service are that the men arrive at the work without the fatigue due to pumping a hand car and can spend the whole day working on the track. Gangs can be combined more quickly in case of emergencies. Men can be more easily secured and held in section work when motor cars are provided. On account of the saving in time and energy, the length of sections can be increased, although the tendency in this regard has been to carry such increases beyond the economical limit. Most roads are realizing that the saving resulting from the use of motor cars for section forces should be mainly in supervision rather than in labor. Sections may be combined so as to give foremen in-

creased territory with larger gangs, dispensing with the remaining foremen, but many men believe that the number of laborers per mile should remain the same in order to keep up the standard of maintenance. One road recommends limiting the length of sections to eight miles on main lines and 12 miles on branches, although these lengths are based on the local conditions existing on that road and could not be universally adopted. The Baltimore & Ohio figures that a saving amounting to \$101.42 per year is necessary to make it economical to substitute a motor car costing \$200 for a hand car whose first cost is \$25. The comparative capitalized cost of the two is estimated as follows:

	Motor Cars.	Hand Cars.
First cost of cars.....	\$200.00	\$25.00
Life of cars.....	6 yr.	5 yr.
Interest on first cost of 5 per cent..	10.00	1.25
Annuity for depreciation at 5 per cent.	20.94	4.52
<i>Operation:</i>		
Gasolene at \$0.15.....	\$49.35	
Oil at \$0.50.....	9.50	
Batteries at \$0.20.....	8.40	
Repairs.....	12.00	
Total .....	\$79.25	79.25
		3.00
Annual cost .....	\$110.19	8.77
		\$101.42

For bridge gangs, motor cars save much time which would otherwise be wasted in waiting for local freights to move the gang from one job to another. Several roads also mention the saving in train service which is effected by distributing bridge material on motor cars.

A power car is almost a necessity for block signal maintainers, for since the signals are widely separated and the stop at each location is comparatively short, most of the time is spent on the road going from one signal to another. This situation has even led many maintainers on roads that do not furnish motor cars to buy their own cars. Some roads report that in addition to the saving in time of the men resulting in an in-

creased efficiency, the use of motor cars allows the maintainers to answer trouble calls more promptly, which means an important operating economy on a busy line.

	FUEL.			REPAIRS.		
	Per 100 mi.	Min. Av. Max.	Per Month.	Min. Av. Max.	Per Month.	
Section .....	\$0.40	1.10	4.00	\$1.00	3.20	5.00
Bridge .....	0.25	1.20	4.00	1.50	3.00	5.00
Maintainers .....	0.17	0.45	.90	1.50	3.15	5.00
Inspection .....	0.24	1.07	4.00	1.15	2.37	4.25
Miscellaneous .....	0.11	1.16	4.00	0.30	2.18	4.00

	REPAIRS.			FUEL.		
	Per 100 mi.	Min. Av. Max.	Per Month.	Min. Av. Max.	Per Month.	
Section .....	\$0.88	1.04	1.25	\$0.36	2.10	10.00
Bridge .....	1.00	1.60	2.21	0.36	1.73	3.81
Maintainers .....	...	...	...	0.75	2.20	4.58
Inspection .....	0.35	0.91	1.95	0.45	1.30	2.81
Miscellaneous .....	...	...	...	0.50	1.50	2.80

It must be remembered that a section car for example, may mean a low power car capable of carrying four to six men over light grades, or it may be one that handles 15 to 20 men on heavy grades. The signal maintainer's cars are all light cars which probably accounts in large measure for the very low cost of fuel for these cars which is shown in the above table. To secure a fair comparison of performance between cars the costs of operation should be figured on a ton mileage basis, but most roads have not attempted such an accurate study of the performance of their cars. On one road, which is conducting extensive experiments on gasoline propelled cars, it has been found that a section car carrying six to eight men can operate for about \$0.50 to \$0.60 per 100 miles for gasoline alone, which is equivalent to \$0.65 to \$0.75 per hundred ton miles.

In this connection the following statement showing the results of the operation of six gasoline motor cars purchased for test purposes on the St. Louis & San Francisco is of interest.

Make.	Location.	Put in operation.	No. days in service.	Days out of service.	Miles operated.	Average No. men daily.	Cost of Gasolene.	Cost of Cylinder Oil.	Cost of Spark Plugs.	Cost of Batteries.	Miscel. repairs.	Total cost to operate.	Cost per 100 miles.	Miles per gal. of gasoline.	Increased efficiency in time saved.
Standard Hand with Fairmont Engine No. 820. Cost \$104.00.	Lockwood, Mo. Northern Div.	7-6-12	144	0	1,877	5	48 Gals. Amt.	5.92 3 1/8 Gals. Amt.	0.75	1 \$1.25 No. Amt.	6 \$0.81 No. Amt.	0 \$9.73	\$0.52	39.1	721 hrs. \$90.12
Fairbanks-Morse Car No. 32. Wt. 890 lbs. Cost \$235.00.	Lockwood, Mo. Northern Div.	8-5-12	124	0	1,681	4	64 Gals. Amt.	9.28 3 3/4 Gals. Amt.	.90	3 3.75 No. Amt.	0 .00 No. Amt.	0 13.93	0.83	26.3	655 hrs. 81.87
Buda Car No. 19. Wt. 900 lbs. Cost \$300.00.	S. Greenfield. Northern Div.	8-10-12	119	0	1,190	4	49 Gals. Amt.	7.10 4 1/4 Gals. Amt.	1.02	2 2.50 No. Amt.	6 .84 No. Amt.	0 11.46	0.96	24.3	423 hrs. 41.41
Rockford No. 4. Wt. 900 lbs. Cost \$225.00.	Everton, Mo. Northern Div.	8-4-12	93	10	918	5	47 Gals. Amt.	6.81 4 1/2 Gals. Amt.	1.21	0 .00 No. Amt.	0 .00 No. Amt.	0 7.50	15.52	1.69	19.3 262 hrs. 31.44
Fairbanks-Morse Car No. 33. Cost \$333.00.	Iron Bridge Gang.	7-27-12	124	0	3,607	15	366 Gals. Amt.	53.07 26 Gals. Amt.	6.24	2 2.50 No. Amt.	8 1.11 No. Amt.	0 62.92	1.74	9.9	716 hrs. 286.08
Buda Car No. 32. Wt. 875 lbs. Cost \$225.00.	Fort Scott. Northern Div.	1-28-12	88	1	694	7	38 Gals. Amt.	5.52 3 Gals. Amt.	.81	2 2.50 No. Amt.	6 .81 1.00 No. Amt.	0 10.44	1.50	18.0	413 hrs. 51.62

NOTE.—Heading "Increased Efficiency in Time Saved" has reference to number of hours saved during week with motor car compared with old style hand car. All of the above cars shown on this test sheet have been operated with the cheap grade of oil or distillate.

crease in their territory, the use of motor cars allows the maintainers to answer trouble calls more promptly, which means an important operating economy on a busy line.

Inspection cars for track supervisors, roadmasters and bridge and signal supervisors have evident advantages. By the use of a car more frequent inspections can be made, keeping the officers in closer touch with the work and creating a better spirit among the men. On some roads a section car has been used to make periodic superintendent's inspections with very good results, although for this purpose some of the larger cars are more comfortable and can be run at higher speeds.

The cost of operating motor cars varies between wide limits on different roads and under different conditions on the same road and the work performed by cars reported in the same

For comparative purposes, the above data must be considered in connection with the service performed. For instance the cost of operating the Fairbanks-Morse car No. 33, carrying 15 men, cannot be fairly compared with that of the Fairbanks-Morse car No. 32, carrying four men. Also the savings in hours and dollars depend largely upon local conditions, including length of sections and mileage run by cars.

The most important question to be considered by a road before the adoption of motor cars is the type which is best suited to the conditions to be met. The growing demand for cars has led to the design of numerous small engines which are adapted to installation on old hand cars. A number of roads have tried this expedient and general satisfaction is reported. One of the principal arguments in favor of the converted hand car is its

low cost. In many cases the foremen themselves have realized the advantage of a motor driven car and have bought small engines themselves when the roads failed to provide them. The advocates of motor cars proper point out, however, that if the full value of the hand car is added to that of the applied engine, the cost is not so far below that of a motor car of equal power. The hand car has the advantage over most motor cars that it is lighter, making it easily removable from the track, an item of considerable importance when section forces are reduced during the winter. On the other hand motor cars are more rigidly constructed and the frame is probably better adapted to stand the service which such a car receives. In the latest design of engines for application to hand cars, one of the early disadvantages that such engines could not be reversed, is being eliminated.

There has been considerable discussion as to the relative merits of two cycle and four cycle engines for cars in maintenance service. The two cycle engine has a number of advantages, being simpler to operate, as the careful valve setting on a four cycle engine is eliminated. It is also possible with a two cycle engine to mix the lubricating oil directly with the gasolene, which eliminates the possibility of trouble from a failure to fill the oil cups. Some gasolene engine men question, however, the advisability of thus mixing the oil on account of the tendency of this practice to increase the carbonization in the cylinders. The principal advantage of the four cycle engine is that it is more efficient, that is, it produces more power from the same amount of fuel.

For the sake of simplicity, motor cars are frequently built with a single speed. Considering the class of men who have to operate them, this is probably advisable in most cases. One road in this report mentions the fact; however, that a variable speed engine is more suitable for inspection, allowing the inspector to examine the track carefully at points where such inspection is needed and to run faster when he is not inspecting, thereby effecting a considerable saving in time.

The manufacturers of motor cars are continually improving their products, and a number of general tendencies in design are noticeable. More steel frame cars are being placed on the market than ever before, a recent development of this type being the welded frame which eliminates all rivets. The wheels used on the cars are not as large as in earlier designs, the usual size specified in the new cars being 16 to 17 in. On account of the unreliability of motor cars in previous years, many buyers insisted that crank handles be provided on the car so that in case of an engine failure the men could pump the car. With the increasing reliability of the motors, this necessity has practically passed and very few of the new cars are being equipped with handle bars.

Motor cars for maintenance gangs and inspectors are not intended for high speeds. While some of the earlier cars were geared to allow a maximum speed of 35 miles an hour or more, this is no longer done and most maintenance men advocate a speed limit of not more than 20 miles an hour. As a large proportion of the accidents are caused by cars being run at too high speeds, it would seem advisable to place some such definite limit on the speed.

The very large number of motor cars which is being used creates a difficult problem in securing gasolene for the operation of the cars at a reasonable price. Principally because of the rapid increase in the number of automobiles the cost of this fuel has advanced very rapidly, and from all indications as to the probable future production and consumption, this price will advance still more in the next few years. Some very important experiments are being carried out by several roads in an attempt to find a cheaper fuel for the operation of all gasolene engines in use. Crude oil has been used with good results in some places for stationary engines, but the difficulties in adapting motor car engines for this fuel have so far prevented its adoption in this field. A product known as "motor spirits," which is considerably cheaper than gasolene, and can be used

without any change in the engine, is also being tried out at present. On account of the importance of this matter, however, further tests will be necessary and some substitute for gasolene or a modification of its use will probably be found to make these cars as economical in the future as they have proved in the past.

### THE STANDARD TRACK SCALE OF THE P. & L. E.

About 1900 the Pittsburgh & Lake Erie rebuilt all of its track scales, using steel frames, concrete foundations and the best 120-ton track scales available. For a short time these new scales gave fairly good results, but in many cases they were not all that could be desired. In 1906 and 1907 more or less serious trouble arose from these scales, largely owing to the large number of high capacity steel cars coming into common use.

An inspection of these scales developed the fact that the design and construction of scales was not keeping pace with the very rapid increase in the weights of cars. Two kinds of defects were evident. In the first place they were those due to the wear of the knife edges which caused a more or less uniform error



Fig. 1—Pedestals in Place in New P. & L. E. Scale.

in the weight shown by the scale, and which could be eliminated at the regular monthly test of the scales. The second class was more serious, and was due to the scales being too light for the car loads, resulting in a displacement of the knife edges, which was liable to change the multiplication and produce errors of considerable magnitude. The deflection of the track beams on the scale also caused a displacement of the knife edges which resulted in errors of considerable magnitude.

Because of the seriousness of the situation it was decided that a new scale should be designed in which these errors would be eliminated. This company communicated with the Fairbanks Co. and made a number of suggestions based on this experience which were incorporated in the design of a new scale. These suggestions were, first: the use of a frame for the support of the track on the scale of sufficient strength to properly carry the car loads without serious deflection between the knife edges. Sec-

ond: adequate construction of the scale parts so that they would possess sufficient strength to properly carry the loads without overstressing. Third: the proper anchoring of the scale to prevent its motion unnecessarily on the knife edges. Fourth: the

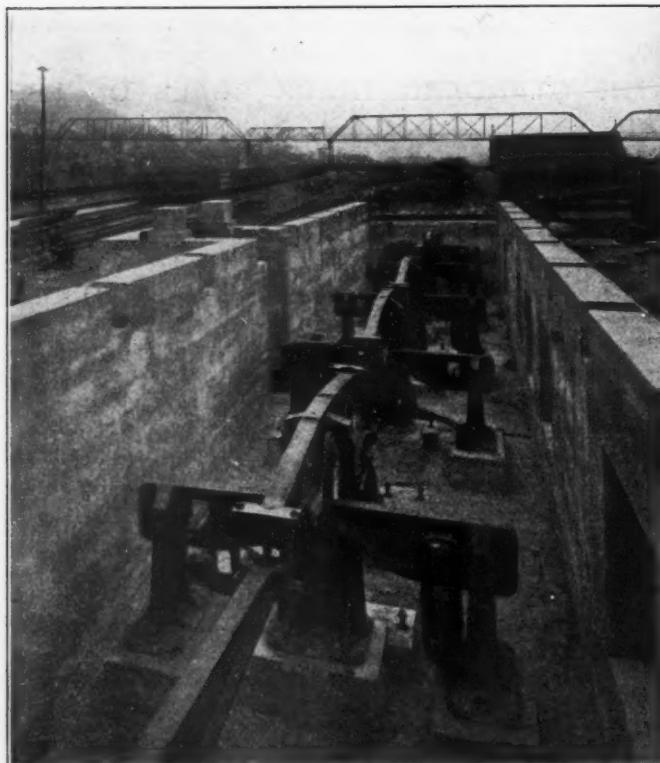


Fig. 2—Arrangement of Levers of New P. & L. E. Scale in Pittsburgh.

use of a rail or bridge at the ends of the scale to transmit the loads onto the scale gradually.

In accordance with these conditions the scale now used on the

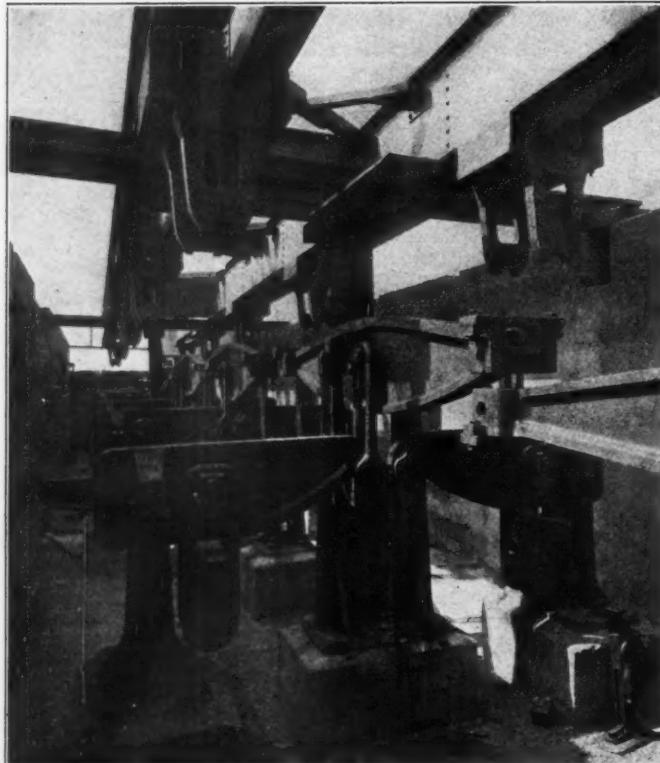


Fig. 3—Construction View of New P. & L. E. Scale.

Pittsburgh & Lake Erie was built. Main lever stands are placed directly on concrete foundations and all pocketing of piers is eliminated. The dead rails are supported on girders entirely independent of the weighing mechanism. The main girders are 24 in., 80-lb. I beams rigidly secured to the masonry walls of the pit by transverse bracing. The main levers are of cast iron with load and fulcrum pivots 12 in. long and with tip pivots 4.5 in. long. All pivots in the end and middle extension levers are heavily reinforced to insure against breakage.

The weighing beam is graduated by 20 lbs. up to 2,000 lbs., and is carefully notched, fitted and sealed. It is equipped with a 50-lb. poise. The multiplication of the levers is as follows: main levers, multiple 4; extension levers, multiple 8½; fifth lever, multiple 6; shelf lever, multiple 2. This gives a multiplication of 33½ at the tip of the middle extension levers; a multiplication of 200 at the tip of the fifth lever and of 400 at the butt of the weighing beam. The extension lever stands are furnished with loose rocker steels to maintain full line contact with the pivot edge at all times. The anchoring of the scale against unnecessary motion longitudinally on the knife edges is arranged by means of substantial rigid connections to the main girders,

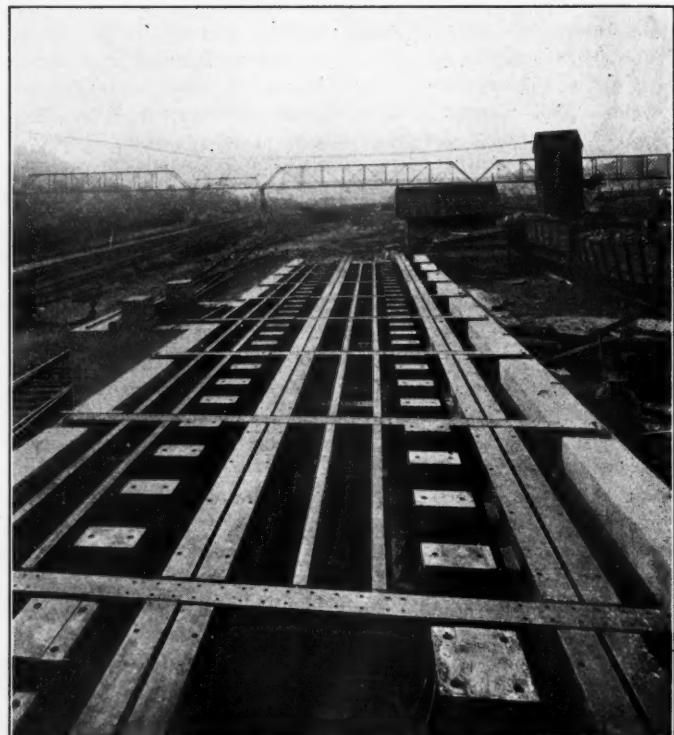


Fig. 4—Top of New Scale Ready for Application of the Deck.

while the transverse movement is prevented by steel castings securely attached to the foundation walls and to the main girders. Pin connections are provided between these castings and a center turnbuckle connection for adjustment. The pivots and bearings are of cast steel ground true to line, hardened and polished.

To enable the load to be delivered to the scale gradually, a "bridge rail" with one end resting on the embankment and the other on the scales at a point in advance of the knife edges, was designed. These bridge rails are between 7 and 8 ft. long, and a wheel moving over this rail at a speed of 4 miles per hour requires a little more than one second to pass from one end to the other, indicating the rate of application of the load. This bridge rail is further provided with easer rails at each end to remove any possibility of "hammering." This arrangement has removed the very serious trouble formerly resulting from the sudden application of the loads, and has also allowed the use of the Streeter-Amet automatic weighing and recording device with good results.

Another feature of the scale is the large pit which is entered by a stairway from the scale office. The deck is constructed of steel plates resting on the masonry on the walls of the pit rather than on the scale itself, eliminating any inaccuracies in weight due to debris on the deck. The openings through which the live rail stands project are covered with metal shields to prevent moisture and dirt from entering the pit.

Another device installed with these scales prevents the weight

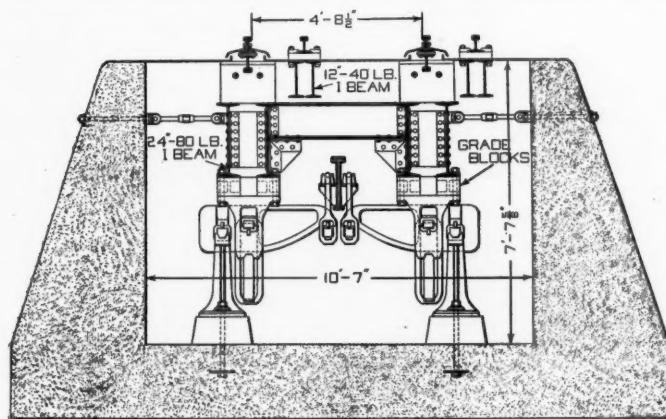


Fig. 5—Cross-Section of New P. & L. E. Scale.

of one car being recorded as long as any other car conflicts with it. If a second car follows too closely the one which is being weighed, this device will prevent any weight being recorded. In this way the trainmen are required to properly space the cars, and as the Streeter-Amet automatic weighing device stamps the scale card, any attempt of the weighmaster to estimate the weight of the car is at once detected.

The first scale of this type was installed at Glassport in May, 1908, and in the five years it has been in service, over 1,000,000 cars have been weighed. At no time has the scale been found more than 40 lbs. out at the regular monthly scale inspection, and

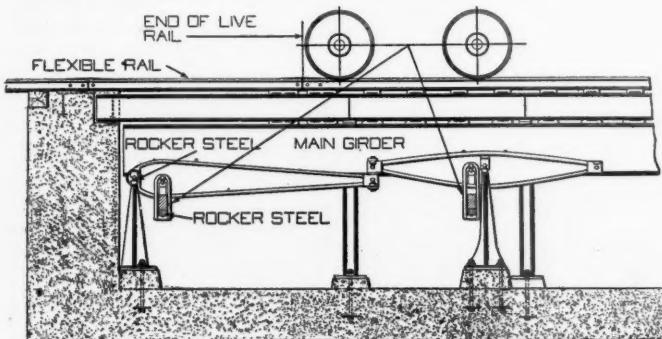


Fig. 6—Distribution of Loads Between Sections by Flexible Rail.

an examination of the knife edges made recently showed that they were in as good condition as when originally installed. The total cost of maintenance of this scale up to the present time has not exceeded \$20. Six of these scales have been installed on the Pittsburgh & Lake Erie at a cost of between \$7,000 and \$8,000 each. The accompanying photographs show the details of installation of one of these scales at Pittsburgh.

The studies of this question on the part of the Pittsburgh & Lake Erie have been made by A. R. Raymer, assistant chief engineer, to whom we are indebted for the above information. This scale was designed by the Fairbanks Company, Pittsburgh, Pa.

**MILEAGE OF INDIAN RAILWAYS.**—Including 658 miles opened in 1912, the total mileage of the Indian railways amounts to 33,484, of which a little less than half is on the standard 5 ft. 6 in. gage.

## ABSTRACT OF ENGINEERING ARTICLES SINCE JUNE 20, 1913.

The following articles of special interest to engineers and maintenance of way men, and to which readers of this section may wish to refer, have appeared in the regular weekly issues of the *Railway Age Gazette* since June 20, 1913:

**The Illinois Central Mechanical Terminal.**—The Illinois Central has recently completed a large yard with roundhouse, shops and car repair facilities at Centralia, Ill. The construction of the tracks and buildings was described in detail in an illustrated article in the issue of June 27, page 1597.

**New Southern Pacific Passenger Station at Los Angeles.**—The Southern Pacific is now completing plans for a new passenger station to be built at Fifth street and Central avenue, Los Angeles. The general features of this station were described and illustrated in the issue of June 27, page 1607.

**New Montclair Station of the Delaware, Lackawanna & Western.**—The Lackawanna has just completed new freight and passenger terminals at Montclair, N. J., involving the expenditure of \$500,000, of which the most important unit is the new passenger station. This station was described in an illustrated article in the issue of July 4, page 9.

**Specifications for Splice Bars.**—The American Society for Testing Materials adopted specifications for medium carbon, high carbon and extra high carbon steel splice bars at the annual convention held in Atlantic City the week of June 24. These specifications were printed in the issue of July 4, page 16.

**The Railroad Valuation Committee.**—The personnel of the committee of railway presidents and of the committee of railway engineers, organized to outline methods for carrying on the work of valuation of railway properties, was given in the issue of July 4, page 18.

**The St. Paul Improvements at Milwaukee.**—The Chicago, Milwaukee & St. Paul has recently made extensive additions to its yard facilities at Milwaukee. These facilities were described and illustrated in the issue of July 4, page 19.

**Assignment of Equipment Valuation by States.**—Three methods for the assignment of equipment used in interstate traffic to the various states for the purposes of valuation, were discussed by A. I. Thompson, engineer, Corporation Commission of Oklahoma, in the issue of July 4, page 21.

**Newark Bay Trestles Rebuilt in Twelve Days.**—Two-thirds of a mile of double track trestles belonging to the Lehigh Valley and a similar amount belonging to the Pennsylvania, crossing Newark Bay, N. J., were destroyed by fire on June 15. Some interesting details of the reconstruction of these trestles in the short period of 12 days were given in the issue of July 4, page 24.

**Reconstruction of the Kaw River Bridge.**—The interesting methods by which three 180 ft. through truss spans were moved transversely and end-wise with little interference to traffic, were described by C. E. Smith, bridge engineer of the Missouri Pacific, in an illustrated article in the issue of July 11, page 45.

**The Minimum Efficient Gradient.**—The minimum limit to which grades may be economically reduced was discussed by Paul M. La Bach in the issue of July 11, page 55.

## RECLAIMING TIMBER WITH A RESAWING MACHINE.

The Lake Shore & Michigan Southern has in operation in its timber yard at Collinwood, O., a resawing machine consisting of an ordinary saw mill equipped with a circular saw and carriage driven by a gasoline engine. At this mill old piling and pile butts too short for bridge work are sawed into cross ties, switch ties and crossing plank, while old bridge stringers, caps and ties are cut up into sway bracing material, planking and miscellaneous lumber. This mill is kept busy most of the time reclaiming timber that otherwise could not be used. The value of the lumber reclaimed to the railway company after sawing varies from \$15 to \$25 per M board ft. The use of this material has been found to make a heavy reduction in the requisitions for new timber.

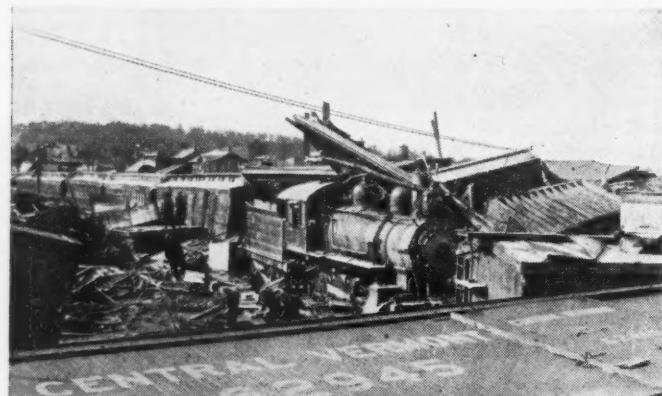
**RAILWAY SURVEYS IN HONDURAS.**—Preliminary surveys have now been completed upon the Trujillo to Juticalpa Railway in Honduras. The route of the new line will pass across the Aguan river, follow the valley of the Bonito river in the direction of Iriona, and continue from that place upstream to the Sico valley. Work will be commenced very shortly upon the first section, namely, that from the Trujillo river to Aguan, a distance of about 26 miles. French and local capital have been employed in the undertaking.

# BALTIMORE & OHIO FLOOD RECONSTRUCTION.

## Description of the General Conditions Existing During the Re-opening of the Lines with Detailed Data as to Specific Points.

The disastrous floods in Ohio, Indiana and neighboring states during March and April, and the enormous damage to railway property resulting therefrom, are familiar to all. Railway men, however, are more interested in the emergency measures adopted to get the tracks back in service than in a narration of the actual damages. For the past three months all efforts have been concentrated toward the reopening and rebuilding of the lines within the flooded area, and it is only recently that information has been available showing the full extent of the damage, the method of handling the repair work and the actual cost.

Between the mornings of March 23 and March 27 precipitation continued almost uninterruptedly over the entire Ohio river basin, resulting in a maximum rainfall at this period of 11.16 in. at Bellefontaine, Ohio, and of 10.6 in. at Marion, Ohio. The rapidly rising rivers flooded their valleys, and railway operations in this vicinity were generally suspended on March 25 and 26. Among the roads in the flooded area, the Baltimore & Ohio-Cincinnati, Hamilton & Dayton system was one of the chief sufferers, having over 400 miles of track either destroyed completely or put out of commission. The losses on this system were variously estimated between \$2,500,000 and \$3,000,000, of which



Results of the Flood at Zanesville, Ohio.

\$1,625,787 is directly chargeable to actual property damage and the balance to losses in traffic.

### GENERAL ORGANIZATION.

As soon as the seriousness of the catastrophe was realized, plans were immediately made to repair the damage as promptly as possible. When it became evident that telegraphic communication would be lost, the relief work on the Baltimore & Ohio proper was placed in the hands of the general manager at Baltimore and that on the Baltimore & Ohio Southwestern and Cincinnati, Hamilton & Dayton in the hands of the general manager at Cincinnati. All general superintendents and superintendents were instructed to remain at headquarters in general charge of the work on their territories while staff officials were sent to the field in charge of repair gangs and relief trains. In the meantime preparations were made to rush men and materials into the flooded area.

The work of reconstruction was at once divided into districts, each under the direct charge of a special engineer, as follows:

Paul Didier, principal assistant engineer, Pittsburgh: Zanesville bridge.

A. M. Kinsman, engineer of construction, Cincinnati: Indiana division, B. & O. S. W. west from Cincinnati.

J. T. Wilson, district engineer, Baltimore: B. & O. S. W. east from St. Louis.

L. G. Curtis, district engineer, Chicago: Indianapolis division, C. H. & D., including Hamilton yards and bridge.

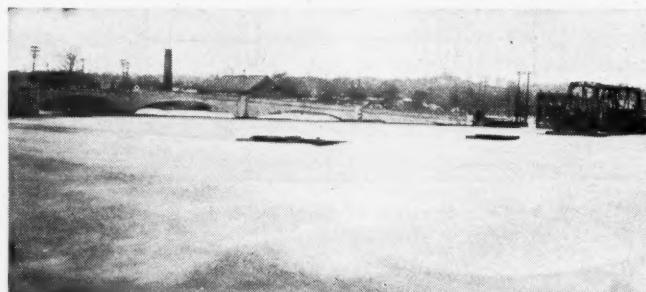
J. B. Carothers, special engineer, Baltimore: Columbus district. F. E. Lamphere, assistant engineer, Chicago; Louisville district. B. R. Hundley, resident engineer, Chillicothe: Chillicothe district and yards.

Claude Brown, assistant engineer, Chicago: Toledo division, C. H. & D., and Dayton district.

W. S. Bouton, engineer of bridges, Baltimore: Bridges.

M. A. Long, assistant to chief engineer, Baltimore: Buildings.

By the time the flood had reached its crest, 7,500 men were moving from the east toward the Ohio river. A somewhat smaller force was gathered west of the flooded area. Closely



Three Spans Gone at Zanesville.

behind them were large quantities of track and bridge material as well as construction equipment, including 20 pile drivers, steam shovels, derricks and other equipment.

In the work of reconstruction the labor problem was a most serious one and to add to the difficulty it rained almost continuously for several weeks, working a hardship among the laborers who came out poorly clothed. Many of these men came from some distance without money, and it became necessary to provide them with store order blanks that they might secure the necessary clothing. At some points the men were supplied with



The Wreckage of One of the Spans at Zanesville.

slicker suits and dry underwear, socks and boots to keep them at work during the rain. The men were fed free of charge until the lines were opened for traffic. At first the laborers were fed by dining car outfits. At one point two dining cars and two baggage cars were utilized for ten days for feeding 400 men in three shifts, each meal requiring only 1½ hours. To avoid feeding men who did not belong to these forces it was necessary to have meal tickets printed and distributed to the men by the time-keepers in advance of each meal. Later, commissary departments were established all along the line.

Unskilled labor was plentiful because the flood had stopped work on the farms and had closed local factories and other industries. Several thousand men were also shipped in from the larger cities. Skilled labor, especially carpenters, was rather scarce and many men who applied for work were inefficient. There was also much difficulty in securing efficient foremen to manage the gangs, although towards the end of the work they

The vast amount of trestle material required made necessary the adoption of extreme measures in some cases to secure it with the minimum delay. In several instances large numbers of piles 60 and 70 ft. long were required, and it was necessary to secure these on special orders. In one instance a trainmaster was sent into Missouri to supervise the loading and shipping of an order of long piles, remaining on the ground until all the



At Work on the Reconstruction of the Zanesville Bridge.

were more numerous and the problem then was to get rid of them along with the surplus unskilled labor.

Some difficulty was experienced in securing the necessary machinery and equipment to handle the vast amount of work, although pile drivers, steam shovels and derricks were secured from a number of roads and contractors not affected by the floods. While of great assistance, this foreign equipment in itself introduced complications in several instances. As an illustration, one pile driver was borrowed from the Soo which had a height of 17 ft. 3 in. above rail. It required careful inquiry to find a route over which it could be sent, and after detouring from

piles were loaded and accompanying them over detour lines until they reached their destination. The sending of a man with all detour shipments of material was generally practiced and greatly facilitated deliveries. In another instance 650 white cedar piling 45 ft. to 65 ft. long were secured at Minneapolis through the purchasing agent of the Soo, who purchased them on instructions from the Baltimore & Ohio according to Soo Line specifications.

While it is impossible in the limited space to go into detail into many interesting methods adopted to get the lines back in service, a description of the methods followed in two or three



The Crossing Completed at Zanesville After One Week's Work.

Chicago by way of Springfield, Ill., it was necessary to lower the track about a foot at West Hamilton in order that the driver would clear the structure. An added difficulty arose at several points because locomotives necessary for handling materials were marooned and unable to reach the points desired. This required additional teaming and hand labor to get material to the point of use. The difficulty in securing teams was relieved somewhat by the fact that many of the towns were under martial law and idle teams were put to work by the state without pay. The influence of martial law was also felt among the laborers, for after a few leaders in small strikes were turned over to the militia officers and put at work without pay, the others were more ready to work for the railways.

of the larger problems may be taken as typical of those over the entire area.

#### ZANESVILLE BRIDGE RECONSTRUCTION.

The most serious damage occasioned by the loss of a bridge was at Zanesville, Ohio, on March 26, when three out of four 128 ft. 6 in. through truss spans across the Muskingum river, were carried out, one span at the west end of the bridge remaining. The water also extended over the main track for a distance of three miles east of the Zanesville station, flowing at the rate of 10 or 12 miles an hour. Gangs of 80 laborers and 78 carpenters were sent from Baltimore by special trains and started making repairs to the track on March 29. A self propelling derrick car

belonging to the Seaboard Construction Company, with a crew, was sent from Philadelphia, arriving at Zanesville on April 1, while another car belonging to the Lucius Engineering Company was sent from Garrett, Pa., arriving on April 3.

About April 3 all the material necessary for the temporary structure was on the ground ready for use as soon as the water receded sufficiently. Pending the fall of the water the time was utilized in framing timber bents, consisting of two 12 in. x 12 in. double batter posts bolted together with 14 in. x 14 in. caps securely drifted to the batter posts and secured by sash and dia-

framed in approximately uniform lengths, they were picked up by the derrick car, weighted, lowered to their proper place and then fitted to the ground. Whatever unevenness was found on the bottom of the river, which is a shale rock, was measured and cut off of the bottom of the batter posts so that on the second or third trial the cap was horizontal and at the proper height to receive stringers. Because of the various lengths of stringers received, it was decided that a maximum spacing of bents of 14.5 ft. center to center was advisable. To insure the bents being placed at these centers a scow was constructed with the proper



One Example of the Flood Damage near Dayton, O.

onal bracing. The height of the bents could only be approximately determined, as several attempts to take soundings with three 100 lb. rails securely bolted together failed because of the swiftness of the current.

Pending the arrival of the derrick cars the men were engaged in removing debris, including box cars and all kinds of flood material from the tracks as fast as the water receded. After clearing the main track up to the bridge it was found that the current was still too swift to enable any falsework to be placed. It was first contemplated that the derrick car on the west end of the bridge would carry the framed bents required on that end from where they had been assembled to the bridge, but this plan was



Destruction of a Bridge at Miami City, near Dayton.

width of outriggers. After the first bent was securely placed this scow was attached to it and to the shore, and the bottom of the next bent placed by means of the scow. The top of the bents was easily taken care of with horizontal laterals.

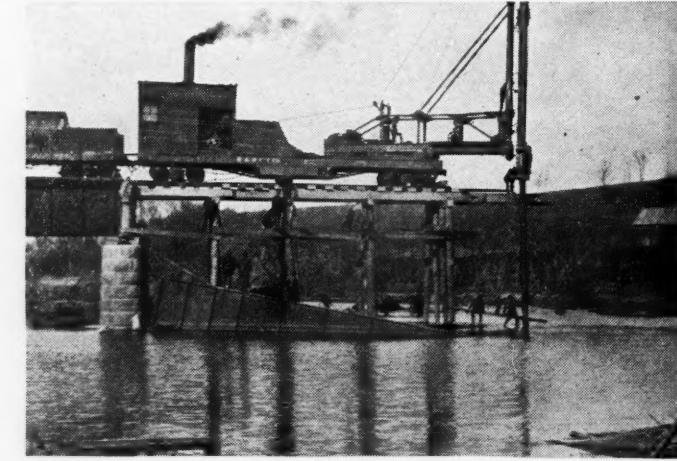
The first bent was placed in the river on Sunday morning, April 6, and the last bent on Friday morning, April 11, 26 bents having been placed in this time. Because of the dangerous character of the work it was decided to eliminate all night work. Following the completion of the trestle the temporary construction deck was replaced with new ties, rails and guard rails, and additional stringers were added. The structure was turned over to traffic on Monday forenoon, April 14.



Damaged Freight at Dayton.

abandoned, as the assembling yard was too far removed from the bridge. It was also found expedient to remove the top struts, top laterals and portals from the remaining span of the bridge so that the derrick car could move over it with the "A" frame up. Although the derrick car was self propelled it was moved back and forth with a shifting engine to expedite the work.

On April 6 the water had fallen sufficiently to enable the placing of the river bents to be started. As these bents had been



Replacing a Girder Span with Piles at Brownsville.

Approximately 14,000 ft. b. m. of lumber and about five tons of bolts and spikes were used in the construction of this temporary bridge, most of the bolts being made on the ground because of the uneven lengths required.

#### REPAIR WORK AT CHILlicothe, OHIO.

Another serious situation existed at Chillicothe, O., where about five miles of track through the city was lost. Here a detour line 4,800 ft. long was built over an old canal towpath as

a quicker means of opening a portion of the line badly washed out. Although the water reached its highest stage on March 26, it was impossible to secure either men or teams until March 29, when eight teams were started grading for this detour track. A trestle about 190 ft. long and 12 ft. high across a ravine was built by a gang of about 30 men, working continuously from Saturday until they completed it early Monday morning. The entire detour of about 4,800 ft. was completed and put in service on Monday, March 31. In laying track on this line it was necessary to take up the rail from a passing track at a station six miles west to secure the necessary material. In the meantime the track from the station west to the east end of the detour line has been rebuilt by a force composed largely of machinists, boilermakers, yard switchmen, engineers and firemen.

Considerable difficulty was experienced in getting a track through the Chillicothe yards, as at the time of the floods all the yard tracks were filled with cars, 75 per cent. of which were loaded. In the vicinity of the coal tipple the tracks were on a fill about 8 ft. high. This fill was completely destroyed and many of the loaded cars were overturned on the main line. On this account it was necessary to build a few feet of track and then run a crane in on this track to remove the overturned cars before further advance could be made. No cribbing was used to build up tracks in the vicinity of Chillicothe except where absolutely necessary to prevent delay to track laying, as the ground



One Track in the Stream at Kent, Ohio.

in this vicinity carries a large amount of moisture, making the life of timber unusually short and increasing the difficulty of future maintenance.

At the west end of the bridge over the Scioto river the embankment was badly washed out for a distance of 5,400 ft., the track being turned over two or three times and left an average distance of 200 ft. from its original location. The grading for this distance was done by hand and the track replaced on it by means of heavy block and tackle. On the next mile the track was left an average distance of 275 ft. from the center line, and it was necessary to cut it into sections and drag it back by teams.

On Wednesday, April 2, the river again rose 12 ft., and at two points east of the Chillicothe yards where the track had been rebuilt slightly above the original surface of the ground, it became necessary to reinforce the light embankment. Three car-loads of cement which had passed through the flood and were therefore useless except for rip rap, were used to protect the bank at this point, finally saving it.

Several thousand yards of good gravel were deposited by the flood on the south side of the tracks about a half mile east of the passenger station. This material was loaded with a ditching machine and used to excellent advantage for ballast.

On this work efforts were made to haul the men to and from work and to meals with work engines to reduce the amount of time spent in unnecessary walking back and forth. To prevent confusion on the work a bulletin outlining the work to be done

the following day was issued daily in the form of a letter to the general foreman, copies being sent to the superintendent, chief dispatcher, trainmaster, master mechanic, and all heads of departments. In this way there was no confusion of orders, each man in responsible charge of any department thoroughly understood what was to be done and there was ample time for suggestions regarding improvements in methods to be acted upon if they were consistent.

At the bridge over the Scioto river there was about 800 ft. of pile trestle, the entire deck of which was removed by the flood and deposited about 100 ft. from the bridge. This deck was recovered in sections by means of blocks rigged on gin poles and with minor repairs was replaced on the trestle.

#### OTHER TYPICAL WORK.

At one point on the Illinois division about three miles of track and one mile of siding were moved from 5 to 20 ft. from their location. In one instance 2,000 ft. of track was moved from the roadbed and left upside down against the telegraph poles in 4 to 6 ft. of water. This track was brought back to the foot of the embankment by block and tackle hitched to "dead men" and trees. It was then necessary to tear the track apart, carry it up the roadbed and relay it.

In this same vicinity it was necessary to drive piles for the crossing of the White river to replace two 210 ft. spans. At this point there was from 30 to 44 ft. of water with a very swift current, making it difficult to start the piles and endangering the pulling of the pile driver in the stream. To overcome this, a  $\frac{3}{4}$  in. steel cable was anchored up-stream and in connection with a block and fall, was used to steady the piles until they were picked up by the hammer.

In driving a temporary structure 1,511 ft. long over the Great Miami river at Hamilton, O., a floating raft was used for spotting piles for driving. This raft was made of 8 x 16 in. stringers with a flash board on the up-stream side to float it in the swift current. It was built in three sections. By means of 6 in. x 8 in. timbers spiked across the top of the swinging raft and extending over the edge, it was possible to spot a pile in the proper position without the necessity of holding it. This raft was readily moved ahead as the work progressed and materially reduced the time required.

At the crossing of the White river about 17 miles east of Seymour, Ind., a considerable amount of track had been washed off the embankment. To get this back in place it was cut into sections of two rail lengths and pulled back onto the embankment with a light locomotive and cables, blocks and "dead men." It was possible to pull up about 1,500 ft. of track per day in this way. In the vicinity of Troy, O., 2,000 ft. of track was turned over. This was turned back without unbolting the rail by raising short sections as nearly vertical as possible with jacks and then using rails for levers back of the point where the ties stood upright.

It is interesting to note that in the midst of this work means were also provided to assist the public in various ways in addition to giving shipments of food and supplies right of way over all other traffic. At Hamilton a bridge was built over the Miami river by the railroad for the county at cost. This structure provides a roadway for teams, street cars and interurban traffic and a 6 ft. walk for foot passengers. It is 500 ft. long and was completed in about ten days. At another place in the same city where there was no means of crossing the river except by boat, a 4 ft. walk was built on the down-stream side of the railroad bridge in connection with its reconstruction.

**NEW RAILWAY IN THE ENGADINE, SWITZERLAND.**—The Lower Engadine Electric Railway, connecting St. Moritz with Schuls and Tarasp, was inaugurated on June 28. The line is to be continued towards the Tyrol, and will eventually constitute a main line from Chiavenna, Italy, across the Engadine to Landeck, Austria.

## FLOOD RECONSTRUCTION ON THE MONON.

By E. G. STRADLING,

Signal Engineer, Chicago, Indianapolis &amp; Louisville, Lafayette, Ind.

The northern and central parts of Indiana are generally level with the river channels going through the broad lowlands in many places. These lowlands are frequently in the form of a series of sweeping curves with the river on the outer edge. With every rise in the streams it is the natural tendency of the water to flow across these lowlands, the stronger current following the shorter inner border of these areas. The railways generally cross these streams with a bridge across the main channel and a long high fill across the lowlands.

In recent years extensive drainage systems have been built



Fig. 1—Monon Tracks in Broad Ripple, Ind., After the Flood Had Partially Subsided.

by the farmers in this vicinity so that today the water which in the past formed ponds several feet in depth is now quickly removed from the fields. With the exceedingly heavy rainfall of March 23 and 24, we have the conditions which caused an unprecedented rise of all streams resulting in their sweeping across the lowlands against the railway embankments which lay across their paths. So rapid was this rise that in some instances the surface of the water was found by actual measure-



Fig. 2—Wabash River Crossing near Lafayette, Ind., at the Crest of the Flood.

ment to be over 3 ft. higher on the up-stream side than on the lower side of the fill. Under these conditions if the fill was sufficiently high and strong to withstand the pressure the water was forced through the bridge opening scouring out the sup-

ports in many cases. On the other hand where the fill gave way the bridge was saved in many instances.

On the Monon there were only two instances of bridges being damaged by the floods. At Gosport a down-stream corner of one pier supporting the bridge over White river was undermined, but the scouring was stopped by the unloading of several car-



Fig. 3—Condition of Roadbed After the Flood at the Wabash River Crossing near Lafayette, Ind.—Ties Standing on End Against Telegraph Poles.

loads of spalls from a nearby quarry. At the crossing of Fall Creek north of Indianapolis, the up-stream end of the center pier was badly undermined and afterwards settled, throwing the bridge slightly out of line. At this point the bridge was returned to its proper position by jacks and will be supported by falsework until a new pier can be built.

Washouts were more numerous. To repair such damage steam shovels were immediately set at work in gravel pits. As the other roads in this vicinity were laboring under the same



Fig. 4—Embankment Across Wabash River Lowlands Restored to Its Former Elevation. Rails and Ties from the Overturned Track Piled on the Shoulder.

conditions it was with extreme difficulty that detour routes were worked out for the movement of this material and other supplies to the points where they were required for repairs.

In one instance just north of Lafayette, Ind., the road crosses the lowlands adjacent to the Wabash river on a fill nearly a mile long, the river proper being at the north end of the fill. The main strength of the flood current was directed upon the opposite end of this fill, and it was in many spots washed out practically to the original ground level. As the track started to slide over the side of the fill the water caught it and turned it completely over or left the ties standing on end against the

telegraph poles. To get this track back onto the bank it was in some instances cut into short sections and drawn back into place by men with lining bars. Another method was to place a "dead man" on the opposite side of the fill and to draw sections of the track back into place with block and tackle. As fast as the track was restored to place, ballast cars were pushed forward and unloaded. Teams with scrapers were also employed to drag gravel back to the top of the roadbed from the toe of the slope where it had been left by the flood. At this same point the telegraph line was badly damaged and a single line of rubber covered wire was laid across the gap by means of a motor boat to reopen service. At this Lafayette washout the track was put back in service in a week almost to the hour from the time when it was washed out.

### THE BURLINGTON'S CONSTRUCTION ORGANIZATION.

The Chicago, Burlington & Quincy has for many years followed the practice of doing as much as possible of its improvement work along existing lines, other than grading by teams, with company forces, and to this end has gradually acquired a large amount of construction equipment. To properly maintain and operate this equipment a separate department was organized about eight years ago under the direction of a superintendent of construction equipment with headquarters at Galesburg, Ill. This officer has charge of all construction equipment assigned to the 4,500 miles of lines east of the Missouri River except that used by the bridge department. The repairs of bridge department equipment are made by the construction department, although the operation is under the direction of the bridge engineer. In general, the duties of the superintendent of construction equipment are to maintain the equipment in proper repair and to supervise its distribution over the various divisions of the road as required, to provide crews, and in conjunction with the local division officers, to direct its economical operation.

Excluding the equipment of the bridge department, the construction equipment on the lines east of the Missouri River comprises 15 Bucyrus steam shovels including two new 70-ton and two new 85-ton shovels, seven Barnhart ditchers, 17 Jordan spreaders, 10 Rodger ballast plows, 34 center and side plows, 14 Lidgerwood unloaders, 1,230 Haskell & Barker cars, 658 Rodger ballast cars and 50 Kilbourne & Jacobs 20-yd. air dump cars. In addition, six American rail loaders, five Browning Engineering Co.'s clam shell excavators and all yard and wrecking cranes as well as 1,200 bunk cars for floating gangs are in charge of this department.

This department was created because of the difficulty in securing a proper output from the shovels and also in keeping them in repair. Largely to insure co-operation in the making of repairs, the superintendent of construction equipment is attached to the mechanical department, reporting to the superintendent of motive power, although in the direction of work he co-operates more closely with the general manager and the engineer maintenance of way. By this connection with the mechanical department, repairs to equipment can be promptly and properly made. As a general rule, however, only emergency repairs are made by the regular shop forces, the routine repairs and annual overhauling being made by the shovel crews while the shovels are laid up during the winter.

The shovel engineers and a portion of the cranemen are retained throughout the winter and are employed in the Galesburg shops in overhauling the equipment. The men work in one gang and completely overhaul each shovel. In this way the equipment is put in proper condition by the men who are to use it the following season, ensuring better work and at the same time giving these men experience of assistance to them in operating the shovels as well as giving them continuous employment. As

a result of this method the delays on the construction work because of break-downs are small and are made by the regular crews. Parts showing indications of early breakage are replaced on Sundays and as far as possible all minor repairs in the field are deferred until this time to avoid delay to the work. As a result there has been no break-down sufficient to require sending the shovel to the shop since this department has been organized.

An inspection of the boilers is made semi-annually by a company inspector and all engineers are required to pass an examination before being allowed to run a shovel. All repair parts for this equipment are kept separately by the store department and the superintendent of construction equipment co-operates with the store department in maintaining the proper stock of material. All requisitions for supplies and repair parts pass through his office for approval before being sent to the store department.

In distributing the equipment to the various divisions the superintendent of construction equipment co-operates closely with the engineer maintenance of way. A list of all work planned for the year with the quantities of material to be moved, the estimated length of time required and the time when it is desired to do the work is made up early in the year and from this a schedule showing the movement of the various items of equipment is prepared. This schedule is revised at frequent intervals as the conditions change so that all concerned know when a shovel or other equipment is expected to complete certain work and where it will go next and can plan accordingly. If a division superintendent desires a shovel for work not shown on this schedule he makes a request to the general superintendent or general manager, giving the details of the proposed work. This request is then referred to the construction department and is complied with as closely as possible.

One advantage of this system of handling equipment is that resulting from concentrating the supervision of company construction work in the one office. The superintendent of construction equipment spends the larger portion of his time on the line visiting the shovels and watching their operation. He is thus able to distribute the auxiliary equipment such as plows, cars, spreaders, etc., to the best advantage, securing the maximum service from the equipment without delaying the shovels. An outfit will frequently have a right hand, a left hand and center plow, although they may only use one for a week or more at a time. Likewise, due to a variation in the length of haul, a crew may be able to release a number of cars for a considerable interval, thus reducing delays on another job or perhaps eliminating the necessity of fitting up other cars. The difficulty of getting crews to release such equipment without some such supervision is too well known to require comment.

Another object in visiting the various pieces of work is to study the conditions under which each shovel is working in order to reduce the delays and increase the output. In addition to seeing that sufficient equipment is at hand the superintendent of construction equipment advises regarding the track layout in the pits or on the unloading dumps. He is also on the ground whenever a shovel cuts in or out in a difficult place. As an instance of the results of the studies of delays it was found this spring that several shovels working in side hill rock cuts were seriously delayed by blasting immediately in front of the shovel. Investigations showed that steam drills were unable to keep ahead of the shovels in these instances and it was found that the substitution of Cyclone well drills enabled the drilling to be kept ahead of the shovel, eliminating these delays. Another recent move has been to furnish pitmen with rubber boots and raincoats and the shovels now work regardless of weather conditions. These boots and coats are turned over to the shovel engineer, who is responsible for them the same as for the tools. All shovels are supplied with tank cars and are coaled and watered at night by the night watchman to avoid delay during the daytime. While these measures are not new on contract work, they

are not all generally found on railway work, with its less detailed supervision.

When out of service for the winter the construction equipment is assembled at Galesburg, a special yard being provided for the storage of that portion of equipment that is not diverted to other uses. All crews are assembled here before going out in the spring. The shovel engineers secure pitmen locally but firemen, cranemen and watchmen are hired by the superintendent of construction equipment. Thus, when a shovel is sent to a division the division superintendent is required to furnish only the work train crews. In assigning shovels it is aimed to give the shovel engineers the same shovels year after year, although greater consideration is given to assigning the engineers to the kinds of work for which they are most fitted. In sending out a shovel the firemen and watchmen are sent with it, while the engineer and cranemen travel by passenger train.

Each shovel engineer sends a daily A. B. C. wire report to the superintendent of construction equipment, engineer maintenance of way, general superintendent and general manager, giving the shovel number, its location, amount of material loaded and the extent and nature of delays. He also sends by mail a weekly report to the superintendent of construction equipment, giving the amount of auxiliary equipment on hand, the amount and nature of the delays during the week and the nature and extent of the repairs made to the shovel. A report is also made weekly by the superintendent of construction equipment to the engineer maintenance of way and general manager, showing the location and condition of all equipment. The time rolls of the shovel crews are made up by the various division superintendents, a copy being sent to the superintendent of construction equipment.

All shovels, plows and other equipment are numbered and a complete record is kept in the office of the superintendent of construction equipment. All correspondence and instructions regarding this equipment are based upon these numbers. The clerical records relating to movement of cars assigned to construction service are kept in the office of the car accountant, although the distribution of the cars is handled by the superintendent of construction equipment, as outlined above.

A large proportion of this construction equipment is diverted to other uses during the winter months when construction work is closed down. The aprons on the Haskell & Barker cars are replaced with end gates and these cars, as well as the Rodger ballast cars, are turned over to the operating department for coal service. Several steam shovels are regularly employed as cranes for miscellaneous yard work and for loading coal while the use of a shovel for spotting cars at an icehouse was described in the *Railway Age Gazette* of March 15, 1912, page 498.

Closely associated with the construction equipment is the distribution of bunk cars for all maintenance forces. The fitting up of these camps, including bunk, dining, refrigerator and commissary cars for various nationalities and their distribution over the different divisions, is handled by this department. Over 1,200 bunk cars are now in service on the lines east. Instead of the division superintendent having to fit up his own camp for his gangs he has only to wire the superintendent of construction equipment the number of men he proposes to put on and the nationality. The cars are then fitted up completely or transferred from another division and sent to the division ready for service.

This work is under the supervision of O. W. Duffy, superintendent of construction equipment, to whom we are indebted for the above information.

**RAILWAY ACCIDENT IN INDIA.**—A railway disaster is reported from Ondal, in Bengal, on a branch of the East Indian Railway. A bridge over a river between the stations of Panchra and Durbajpur was partly washed away on July 4 by a heavy flood. A passenger train which left Ondal at 4:30 a. m. on July 5 ran on to the bridge. The engine and eight passenger cars were precipitated into the river. The other cars were saved by the breaking of a coupling. Fourteen bodies have been recovered.

## INGOT IRON.

An article was published in the *Railway Age Gazette* for September 30, 1910, on the development of the manufacture and the peculiarities of ingot iron as made by the American Rolling Mill Company, of Middletown, Ohio. Ingot iron was then shown to be an almost pure iron and, as such, possessed of high rust resisting qualities. When compared with the Swedish charcoal or English wrought iron, its ultimate strength was about the same, while its limit of elasticity was considerably greater. At that time it was made in small ingots weighing from 800 to 1,000 lbs., and the total output amounted to about 25,000 tons a year, a very large percentage of which was rolled into sheet metal of gages ranging from 12 to 20, and, after having been galvanized was worked up into corrugated culvert pipe. The iron is nearly pure, and as such, its rust resisting qualities made it especially valuable for this purpose. The metal was also used for electrical work, where sheets of great purity were required.

Since that time the company has built a new mill at Middletown and added to its facilities so that the present output of ingot iron is about 50,000 tons a year, or an increase of about 100 per cent. in three years. The metal itself, so far as its chemical composition and physical properties are concerned, is about the same as before, but constant investigation and research have developed a number of modifications in methods of manufacture that have put the output on a far more extended commercial basis. In 1910 the ingots employed in the manufacture of this material weighed approximately 1,000 lbs. Since the completion of the new mill, which embodies the latest and best principles of modern rolling mill construction, larger ingots, approximately 6,500 lbs. in weight, are now produced. These ingots remain liquid for a much longer time than the smaller ones, so that there is better opportunity for included gases to escape than there was under the old methods. In addition, the larger ingots necessarily receive about four times the amount of working in the rolling which obviously produces a denser and more uniform product.

In 1910 nearly the whole output was rolled into thin sheets and used for culverts or electrical work, and no heavy plates were rolled. In addition to its exceedingly wide application in the manufacture of corrugated culverts, it is now rolled into plates up to  $\frac{1}{2}$  in. in thickness, and these are extensively used for stand pipes for water, gas-holders and oil tanks. A prominent oil refining company finds that its life in the bottom of stills is from two to three times that of steel. It is especially valuable for gas-holds where the metal is alternately wet and dry; as with galvanizing, it holds the paint better than steel and does not need repainting as frequently. It is extensively used for vats and kettles in breweries. A prominent railroad is having 600 refrigerator cars built, whose roofs are to be of ingot iron, and a large car company is building 67 tank cars from the same material, to carry acid. The smelting companies find that the hoods over their furnaces last two and three times as long when made of ingot iron as when steel is used. On a 6,000 ft. pipe line in Colorado, that runs through an alkali soil, ingot iron is being used by the government. This includes, not only the pipe itself, but all flanges and rivets. Recently it has been rolled into wire rods and drawn into wire, and is extensively used for wire fencing. It is curious that this turns out to be one of its later applications, although it was Dr. Allerton Cushman's investigation into the rapid corrosion of fence wire that was the immediate inspiration of the investigations that led to the development of ingot iron. It is also found to be an excellent basic metal for the manufacture of crucible steel and experimental applications also show it to be especially suited to the making of boiler tubes. It is thus occupying a continually broadening field of industrial application and promises to become one of the most extensively used of the staple iron products.

It was learned very early in the development of the process

that the presence of oxygen in the iron had a very injurious effect. It rendered the metal brittle and difficult to roll and produced blisters on the galvanized sheets. For that reason it has been the custom, at Middletown, to analyze for oxygen in every heat and the present practice is to put an upper limit on the content at .05 per cent., though this is seldom touched, as the furnace practice holds it at from .02 to .03 per cent. It is understood that the furnace practice involves the burning out of the impurities by a protracted high temperature, so that the time required for melting and refining a charge of 60 tons in an open hearth furnace runs from 12 to 14 hours, as compared with from 9 to 11 hours when the mild steels are made. The long duration of the refining period and the extremely high temperature required to reduce impurities to but little more than mere traces results in a considerable oxidation of the iron itself, which oxidation makes necessary a subsequent corrective treatment. The final result is that the oxygen is reduced to a point as low as it is possible to bring it by means of the best known deoxidizers.

As for the nitrides existing in the metal, for it is assumed that most of the contained nitrogen exists there in the form of nitrides, considerable has been done towards their elimination, and they are the object of attack and investigation by the research department of the works. The practical methods employed to purify the metal are to stir the bath vigorously at frequent intervals, so as to stimulate the liberation of the gases, and to allow the bath to stand after it has melted until the gases are well out of it. Not only do the large ingots remain molten for a much longer time than the small ones previously used, but ingot metal remains fluid much longer than steel, and even when there is a substantial shell of solid metal formed about the outside of the ingot, there will be a central core that is very fluid through which the gases are free to rise. Ingot iron does not seem to pass through the prolonged plastic condition so characteristic of steel but remains soft until it suddenly freezes; so that it is frequently from 20 to 30 minutes after an ingot is poured before it solidifies at the top. This probably explains, in part, why it has less nitrogen, even, than crucible steel. This nitrogen content is now being very carefully watched, while every heat is analyzed for oxygen. The method includes the splitting of ingots, the analysis for oxygen, hydrogen and nitrogen and an examination under the microscope with occasional researches with the spectroscope.

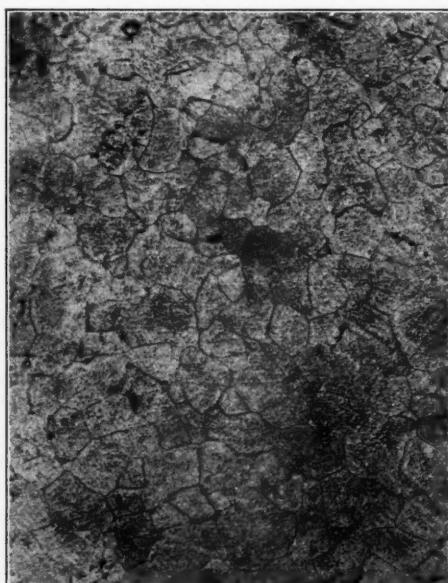
The elimination of nitrogen is of utmost importance because of its detrimental effect on the metal. Fortunately the contained quantities are very small and so their total effect is not very bad.

Nor do we know as to exactly what the total influence may be, although it is definitely known that it causes brittleness and cold shortness in exactly the same manner as phosphorus, except that it is estimated that the effect of nitrogen is nine times that of phosphorus, the quantities being the same.

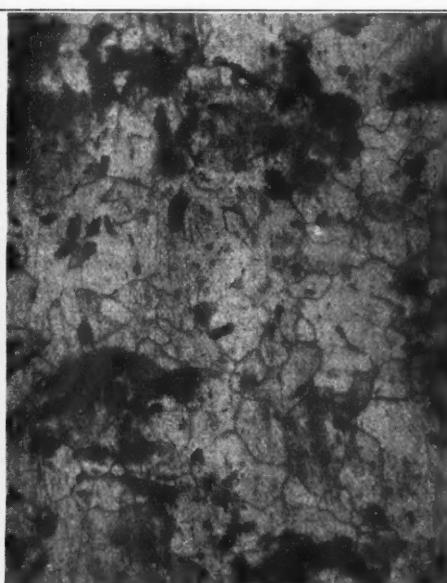
Back of all this detail of manufacture lies the selection of raw materials, and this is done with even greater care than it was three years ago. This applies particularly to the scrap that is used. It has been found, for example, that the use of turnings, bought in the open market, is apt to introduce an excessive amount of copper into the bath, so that this class of material has been entirely discarded and no turnings are used in the manufacture of ingot iron. A limit is set to the allowable copper content which is put at .04 per cent., though, in practice, it usually falls to .03 per cent. or less, and this has become a part of the regular specification for the material. It is claimed that if a small amount of copper is introduced into steel, it may add to its rust resisting qualities provided the distribution throughout the mass is uniform, but that this distribution is difficult to obtain is evidenced by the fact that tests made from steels that have been intentionally treated with copper show wide variations in their tendencies to corrode, so that while good results may be obtained they are not reliable and to be depended upon. Hence, as it has been the aim of the company to produce a pure metal, the elimination of copper is considered to be one of the requisites of such a production.

This addition of the copper specification and limit has made the analysis of the metal much more elaborate than that ordinarily used. As it stands, the laboratory of the American Rolling Mill Company analyzes every heat, not only for the five ordinary impurities, carbon, silicon, manganese, phosphorus and sulphur, but for oxygen and copper in addition, with frequent tests for nitrogen.

Great stress is laid on the purity of the metal, and as stated in the previous article: "It furnishes the strongest support we have yet had on a large scale of the soundness of that somewhat complicated hypothesis—the electrolytic theory of corrosion. From time to time examples are brought to light of the remarkable resistance to corrosion of specimens of pure iron. Among these may be mentioned the links used in forming the suspension chain of a bridge at Newburyport, Mass. These links were exposed to all the vicissitudes of a New England seacoast climate for more than 100 years, and yet showed no appreciable corrosion. It is interesting to mark the close resemblance of the structure of this old iron to that of ingot iron as shown by the accompanying engravings, and to contrast the



American Ingot Iron Transverse  
Section x-70.



Charcoal Iron Sheet Longitudinal  
Section x-70.



Newburyport Link Transverse  
Section x-70.

cleanliness and distinctness of the granular formation of these two metals with that of a piece of typical wrought iron in which streaks of slag are so much in evidence.

It is probable that this absence of slag as well as the low percentage of included gases has much to do with the increased density of ingot iron as compared with steel or even Norway iron. The specific gravity of steel may be taken at 7.84; of Norway iron of the grade used in the Newburyport bridge it is almost 7.95, while for the ingot iron it is 8.00. As to whether this increase of density has any influence on the behavior of the metal under various conditions of manipulation is not known, but it is, at least, reasonable to suppose that it has.

Besides its greater resistance to corrosion than steel, ingot iron shows a marked superiority to those older metals when subjected to galvanizing. There is not only a very marked difference in the appearance of galvanized sheet, but an equally marked difference in the resistance to wear. In appearance the spangles of zinc on an ingot iron sheet are large and cover the sheet with an almost uniform sheen. On steel the spangles are smaller and of great difference in brilliancy. The wearing qualities of galvanized steel sheets are also much less. The zinc coating seems to be more brittle and likely to flake off, and is much more susceptible to the action of corrosion. It has been found that ingot iron is much more durable when made into galvanizing tanks than is steel, and this because it is less soluble in the bath. This has been set forth as an explanation of the reason for the greater durability of galvanized sheets. The ingot iron being less soluble in the zinc than the steel, the layer of zinc-iron alloy, between the coating and the sheet, is thinner and yet thick enough to hold the two firmly together. With the steel the connecting alloy is not only thicker, and partakes of the nature of dross, but the coating itself is permeated with a larger per cent. of iron, which thus renders it more susceptible to corrosive action than obtains with the purer coating found on ingot iron. In like manner it has been found that ingot iron will take enamel coatings much more readily than steel, and that such coatings are much less likely to have pin holes when placed on the iron than when used on steel.

It has been known for a long time that there is a critical zone ranging from approximately 350 to 450 deg. Centigrade, where mild steel, such as that used for boiler plates, cannot be worked—that is, bent. Metal that can be bent flat on itself cold, or at a cherry red, will crack if any attempt is made to bend it at the blue temperature. So with ingot iron. There is a zone extending from about 800 to 1,000 deg. Centigrade in which it is unsafe to attempt to work it, and within this zone it is quite impossible to punch or bend it. Under ordinary handling, when within this zone, it will crack. Above or below it will stand the severest punishment. The method recommended for flanging, or similar pieces of work, is to raise it to a welding temperature and work rapidly until down to an orange, finishing before that temperature is reached, if possible. If this cannot be done allow the metal to stand until the critical zone is passed and then resume work. It is interesting to see a demonstration of this where the metal at the higher temperatures can be bent back and forth and badly maltreated without showing any crack or flaw. Then, suddenly, as the temperature enters the critical zone, it will begin to crack. Pieces will break off under very light blows of a hammer and this will continue until the zone is passed, when, with equal suddenness, the breaking will cease and the metal resumes the toughness and ability to resist bending that it had before. These are points that must be carefully observed by any one who wishes to work the metal successfully.

This characteristic shows itself to a very marked degree in rivets. Ingot iron rivets cannot be driven at a temperature above the critical zone, else they will crack as they are subjected to the cooling stresses in passing through it. But they can be driven very successfully below the zone and will hold perfectly. This simply means that they must be driven at a low temperature.

One of the marked and valuable features of ingot iron is the ease with which it can be welded. It is extensively used for making electrical transformer cases. These are stamped to shape and welded together with an acetylene torch, using another strip of ingot metal as a welding metal almost as though it were solder. It is also extensively used as a filling metal for autogenous welding and has been found to be far superior to the best Swedish bar for this purpose, because of its purity and freedom from slag.

In using the metal for this flowing-in process of welding it is, of course, always left or finished at an exceedingly high temperature. This seems to make no difference with the microscopic structure, and the grains set in symmetrical shape. Nor is there any appreciable effect on the tensile strength or elongation. But if it is subjected to cold rolling at a low temperature, the ultimate strength may be increased to 68,000 lbs., while the elongation may be cut down to 6½ per cent., whereas before the cold rolling or wire drawing it would stand at from 30 to 33 per cent. But, again, it is the purity of the metal on which its many applications depend. It is one of the few that meets the government requirements for tin plate, that the sheets shall not contain more than .03 per cent. of manganese, sulphur or carbon.

#### THE STANDARD SCALE TESTING CAR OF THE U. S. BUREAU OF STANDARDS.

On July 1 an appropriation became available for the purchase of a scale car by the Bureau of Standards of the Department of Commerce in Washington for use in testing large scales and weighing machines. While the larger railway and industrial corporations have provided scale cars for testing the accuracies of their scales, many individual owners and users of scales have no means of verifying the correctness of the scales over which their business is transacted. To enable these scales to be properly tested as well as to provide a uniform test for all scales this car has been designed.

A car will be provided for housing and transporting the equipment proper. The main items of the equipment will consist of eight 10,000 lb. weights, four 2,500 lb. weights, 200 50 lb. weights and other smaller weights making a total of over 100,000 lbs. of test weights. Auxiliary equipment consisting of a motor driven truck will be provided for handling the weights, holding them during tests and carrying them from point to point on the platform of the track scales. A crane will also be provided for handling the weights and truck and for storing them for transportation. A gasoline engine driven 10 k. w. generator for supplying power, a storage battery, lights, office space and auxiliary equipment for studying the action of the mechanical parts of the scales will also be included on the car.

This equipment is being constructed by A. H. Emery, of Stamford, Conn., in accordance with the plans of L. A. Fischer, chief of division of weights and measures, Bureau of Standards, and C. A. Briggs of that bureau, who will have charge of the car. The construction work on this car is well advanced and the equipment will be ready for use about early fall.

Statistics of the number of wooden poles purchased in the United States in 1911 by steam and electric roads, electric light and power companies and telephone and telegraph companies are presented in a bulletin soon to be issued by the Bureau of the Census, Department of Commerce. The total purchases of poles for 1911 amounted to 3,418,020 sticks of timber of which 70.3 per cent. were purchased by telegraph and telephone companies and 6.7 per cent. by steam railroads. Cedar timber provided 61.4 per cent. of the total number of poles used, while the number of chestnut poles used has increased 177,440 since 1908. The number of oak poles decreased 65,000 from the preceding year. The use of pine has increased very little since 1907, while the demand for cypress has fallen off each year. Of the total number of poles, 159,321 were creosoted entirely or in part.

## AN ECONOMICAL TRAVELER FOR DISMANTLING A TRAIN SHED.

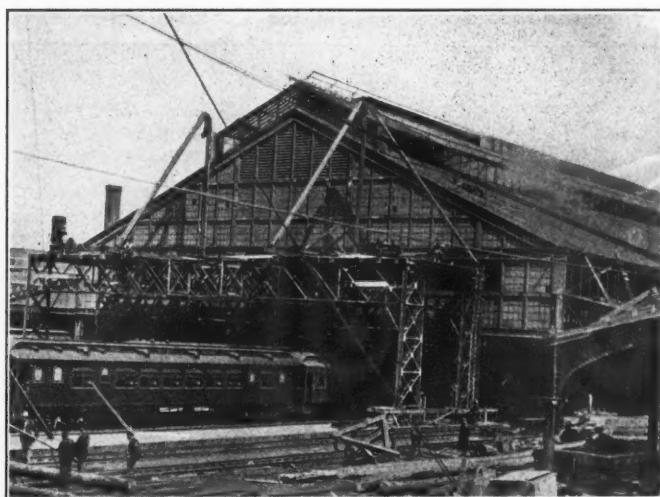
In connection with the reconstruction and enlargement of the passenger station of the Central Railroad of New Jersey at Jersey City and the construction of a new Bush train shed, it was necessary to remove the old high train shed. In the dismantling of this structure recently an interesting form of traveler was successfully used.

The old train shed was 512 ft. long and 142 ft. 7 in. wide, exclusive of extensions on each side 36 ft. 6 in. wide. The main portion of the shed spanned eight tracks and was carried by 16 trusses spaced 32 ft. between centers. The vertical reactions of these trusses were transmitted through hinged joints to vertical posts and the horizontal thrusts were carried by the cantilever extensions resting on brick walls as shown in the accompanying cross section. Because of this peculiarity of construction it became necessary to dismantle the main portion of the train shed first.

To remove this center portion a traveler was built up from three new signal bridges designed for use later on the main line. These bridges were of 109 ft. span and were spaced 15 ft. and 26 ft. respectively, between centers from the forward end. They were planked over solidly so that no material could drop through. Two hoisting engines and a boiler were placed over the rear bridge and two five ton stiff leg derricks with 40 ft. booms over the middle bridge. No equipment was placed on the forward bridge which supported the trusses during dismantling. The traveler was mounted on wheels running on

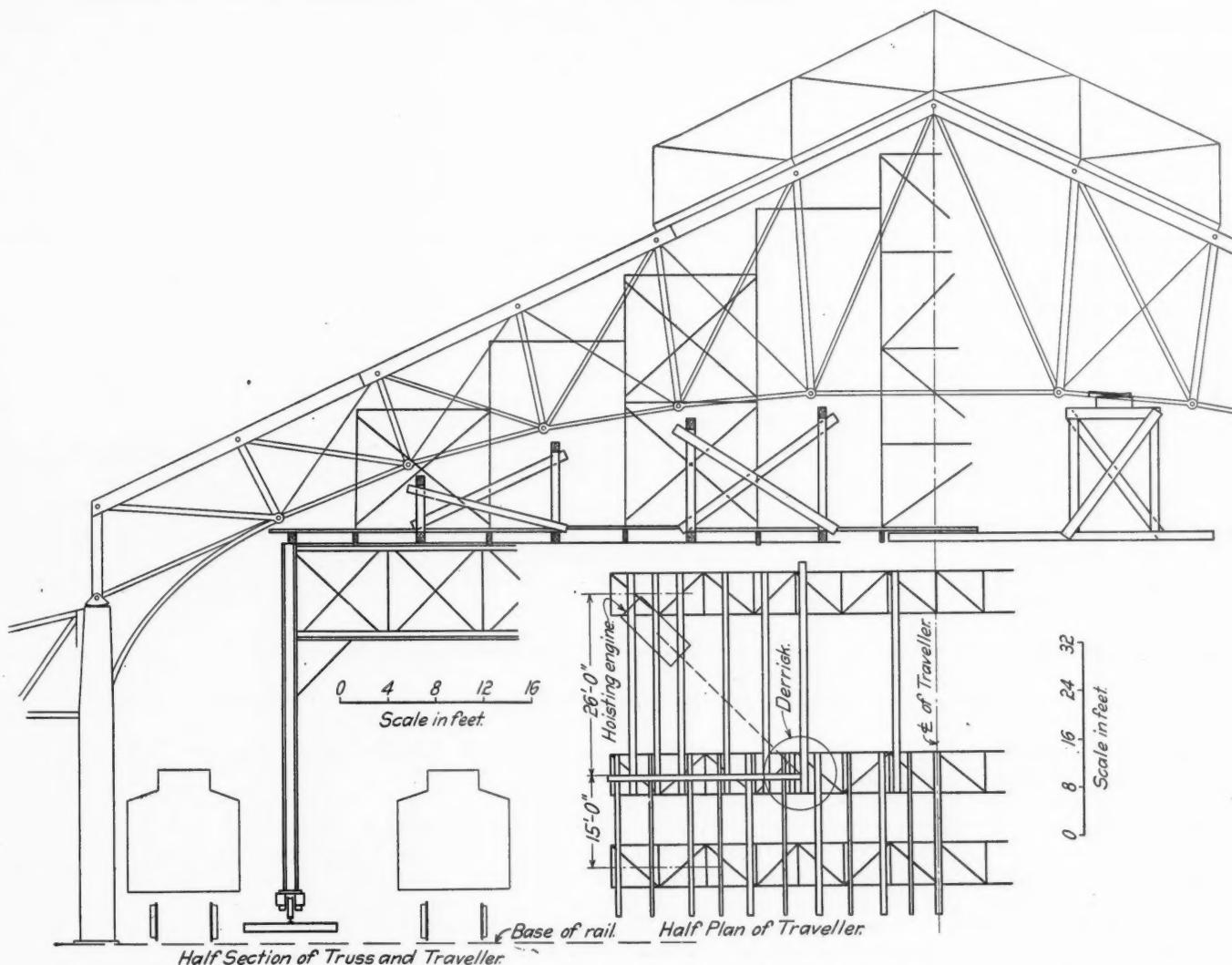
rails and was rolled from one span to the next. These bridges were erected and the equipment placed on them with a derrick car.

In dismantling the trusses the skylights and roof were re-



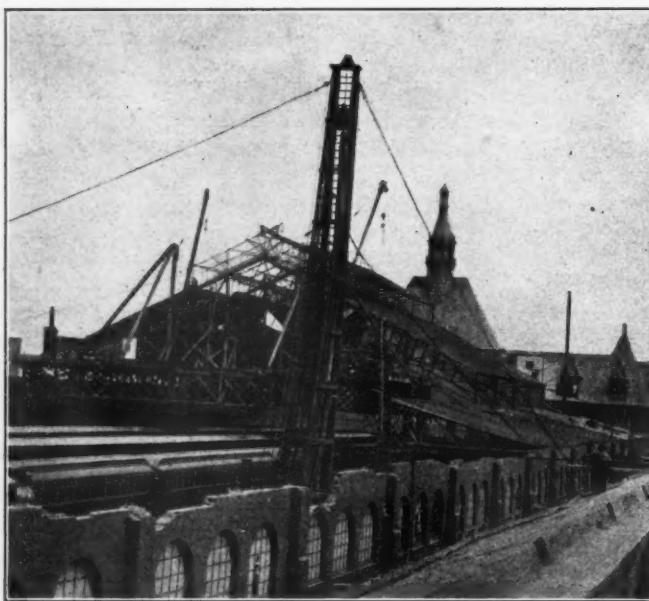
Traveler Erected Preparatory to Beginning Work on First Truss.

moved one panel ahead of the traveler after canvas had been stretched below to protect passengers from falling material. The order of procedure in removing a truss was to jack it up



Half-Section of Traveler and Truss and Half-Plan of Traveler.

on blocking on the forward bridge, knock out the pins and cut the members at the splices with an oxy-acetylene flame. They were then lowered piece by piece by the derricks onto the platforms and then onto cars on tracks outside the traveler. After the last truss was dismantled the three signal bridges were



Dismantling of Train Shed Nearing Completion.

removed in two hours. After the platform, engine and derricks had been taken down, two 20 ton derricks picked up the bridges one at a time, moved them back 500 ft. and set them down. A large derrick then swung them around and loaded them on cars for removal.

This work was handled expeditiously and economically by this method without injury to anyone. After the work was well started an average of one truss per day was dismantled.

## AN EFFICIENT ORGANIZATION FOR BRIDGE AND BUILDING WORK.

By M. RINEY,

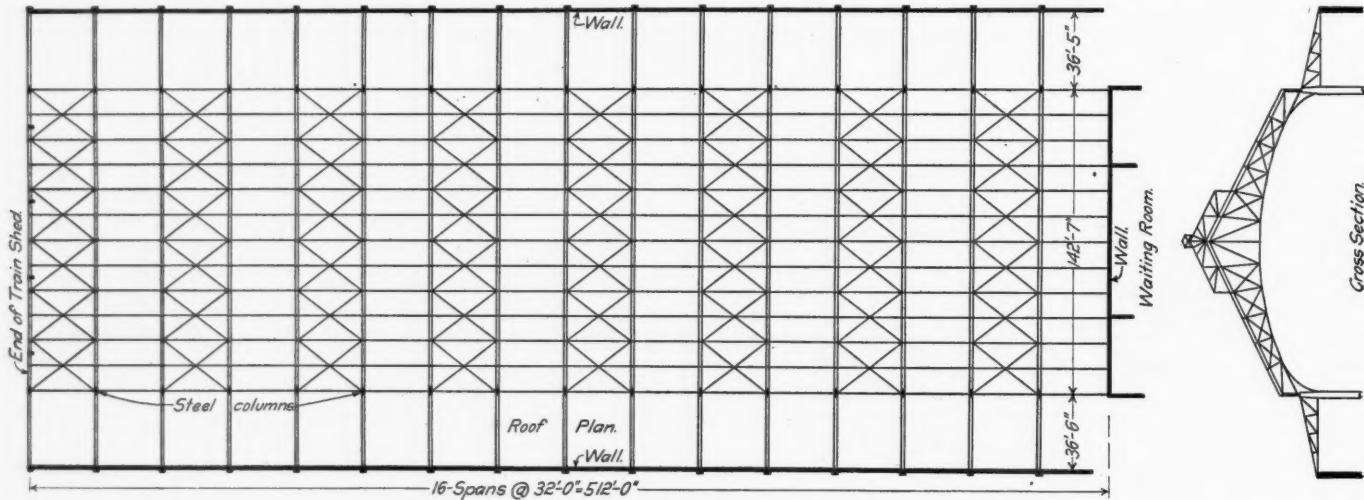
Foreman, Bridges & Buildings, Chicago & North Western, Baraboo, Wis.

In the organization of an efficient bridge and building force the first essential is a competent foreman and a gang composed of reliable bridge men. These men should be located at some point on the subdivision where they can always be quickly reached in case of an emergency. The crews on each subdivision should be of sufficient size that they can keep up with their work without temporarily increasing forces at any time during the season, as the practice of rushing the season's work with a large force of men and then dismissing them in the fall, makes it very difficult to secure and hold competent men. It has been my experience that where one can keep men constantly employed the year round greater efficiency is secured.

The men should receive good compensation for the service and should be provided with good tool and bunk cars. They should also be supplied with gasoline motor cars so that they may be able to get over their respective territories more quickly than with old-style hand cars. I believe that gangs equipped with motor cars will show a saving of at least 20 per cent. in labor.

We have followed for many years the practice of furnishing the foreman of each subdivision with a copy of our bridge inspection report so that he will have a list of the work authorized for the coming season. The material for this work is stored and shipped out as ordered by each foreman so that the crews are not delayed waiting for material.

In the building department, by properly arranging the work, a crew of from five to seven men can take care of the repairs and renewals of buildings, water tanks, etc., being constantly on the lookout for minor repairs to station platforms, stock yards and water stations not authorized on the budget. The work should be arranged so as not to shift the men any oftener than necessary and all material for each job should be on the job before the work is started. At division headquarters the bridge department should have a shop equipped with steam or gasoline



Plan and Cross-Section of Old Train Shed.

The traveler was erected on April 13, and after placing the equipment on it work was started on removing the end frames of the first truss on April 22. The last truss was removed on May 17, and the traveler was dismantled on May 21. As the signal bridges will be installed on the main line without alteration, the cost of a traveler, amounting to about \$4,200, was saved.

This work was handled under the direction of J. O. Osgood, chief engineer, A. E. Owen, principal assistant engineer, and J. J. Yates, bridge engineer. Terry & Tench, of New York, were the contractors.

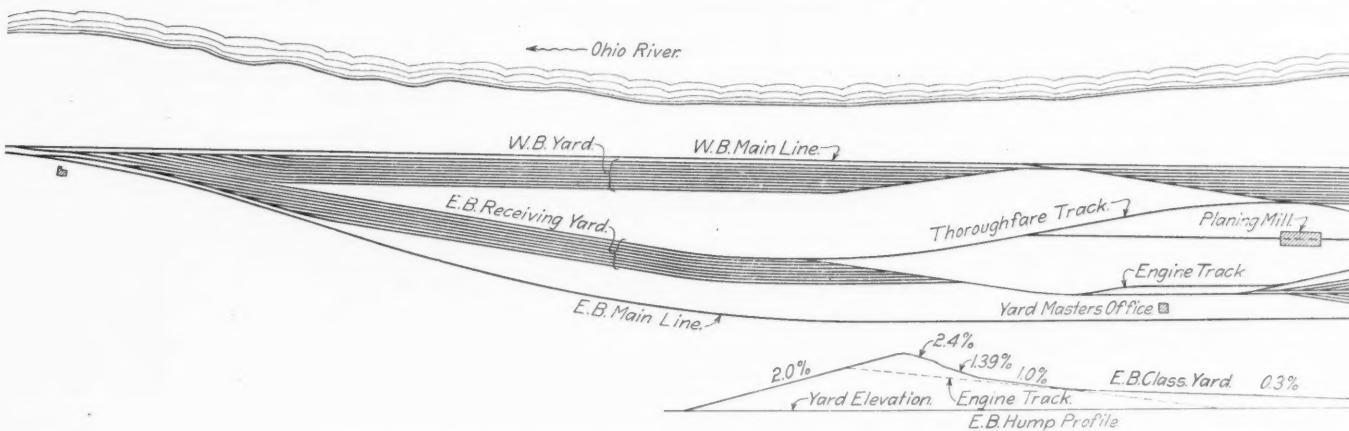
power and with saws for cutting timber for routine repairs and for emergency work.

RAILROAD CONSTRUCTION IN ECUADOR.—The Manta to Santa Ana line has been under construction since the early months of 1911. Some 30 miles have been finished, and these are being opened to the public. About nine miles, yet to be built, will complete the railroad. So far the construction has cost the nation nothing. The concession stipulated that no payment of any kind was to be made to, or any obligation incurred by the federal government until the whole line was finished.

## CHESAPEAKE & OHIO YARD AT SILVER GROVE, KENTUCKY.

The new Chesapeake & Ohio classification yard at Silver Grove, Ky., about 12 miles east of Cincinnati, Ohio, was completed early last summer and has been successfully operated since that time. It was designed especially for classifying eastbound business as the yard at Russell, Ky., near the junction of the lines to Cincinnati and Louisville, handles the westbound classification. It was also badly needed to supply holding tracks for westbound business. The principal loaded move-

The site is closely adjacent to the Ohio river on low, level ground. The main line at this point is on a fill which averages 8 to 10 ft. high, the grade being fixed to keep the tracks above the highest water stage. To reduce the amount of grading necessary for the new yard, the yard level was fixed at a grade 3 ft. below the main line and all openings through the main line embankments were provided with valves to make those embankments serve as dikes for the yard site in extreme high water stages. The filling material for the yard was obtained from four borrow pits closely adjacent to the yard and consisted almost entirely of clay and loam. The fill required



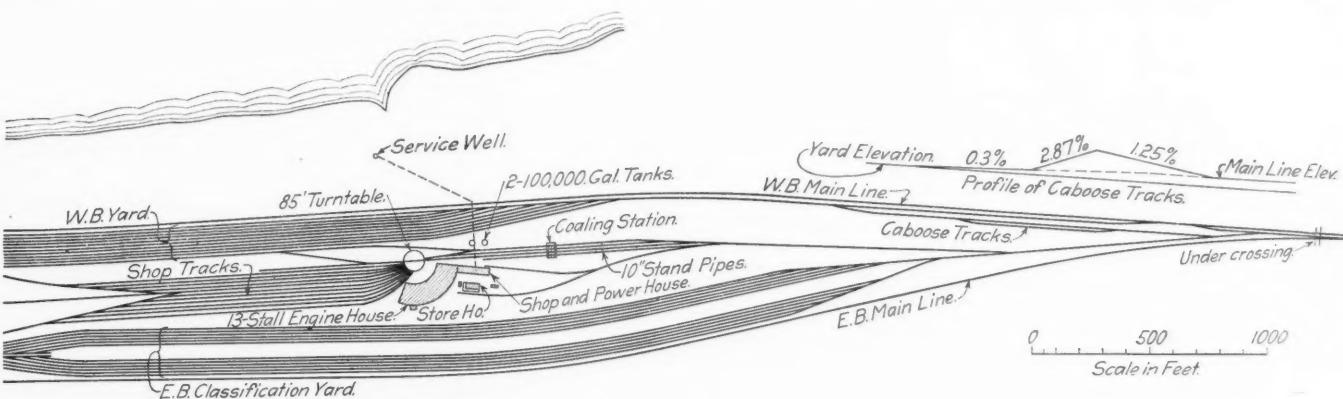
Track Plan of the Silver Grove Yard of the Chesapeake & Ohio.

ments eastbound through the new yard are grain and manifest freight. In addition to this class of traffic there are a very large number of empty coal cars returning to the eastern coal fields. The new yard will also handle a heavy transfer business for the Cincinnati district.

Since practically all the classification is eastbound, only one hump was built. The eastbound receiving yard is graded for 12 tracks and is laid with eight tracks 3,000 ft. long converging on a ladder leading to the hump from which the cars are dropped into a classification yard of 12 tracks each 3,770 ft.

1,100,000 cu. yds., the maximum height under the hump being about 18 ft. The material was handled in standard gage Kilbourne and Jacobs cars.

The hump profile, which is shown in the accompanying drawing, was adopted after careful study of existing yards that are operating successfully, the design being similar to that adopted a few years ago in building the yard at Russell. The approach is on a 2 per cent. grade; the accelerating grade off the hump is 2.4 per cent., with 40 ft. of 4 per cent., flattening to 1.39 per cent., then to 1 per cent., then to 0.3 per cent., and then to level



Yard Elevation.

Track Plan of the Silver Grove Yard of the Chesapeake & Ohio (Continued).

long. The double ladder arrangement is used in the entrance to this classification yard, the middle tracks being spread to allow the addition of four more tracks when the traffic requires it. The westbound receiving yard has 10 tracks each 3,150 ft. long and the westbound classification yard has 10 tracks each 3,224 ft. long. In addition to these main yards there are 10 shop tracks and two caboose tracks, as well as thoroughfare tracks, engine tracks and necessary service tracks around the engine terminal. The eastbound main line is carried around the yard to eliminate switching movements across the main line in entering and leaving the yard.

in the yard. The hump engine used is a Mallet compound weighing 285,000 lbs. The yard is laid with 75 lb. rail on oak ties, the turnouts from the main line being No. 10 with spring frogs and the turnouts in the yard being No. 7. The total length of track in the yard is 35.06 miles.

A complete engine terminal is provided between the eastbound classification and the westbound receiving yard, which includes a 13 stall engine house of brick on concrete foundations, an 85 ft. turntable with electric tractor, a machine shop for running repairs to locomotives, a timber coaling station for coaling on three tracks which was designed by the C. W. Hunt Co.,

who also furnished the machinery, an electric power plant which contains three 150 h. p. Sterling boilers, one 185 k. w. generator and one 125 k. w. generator, the power being used for driving all machines in the shops and for lighting the buildings and yards. There is also a car shop for repairing all bad order cars, a storehouse, planing mill and a number of miscellaneous buildings.

The water supply is secured from a well opposite the roundhouse between the yard and the river. This well consists of a cylindrical concrete shaft 15 ft. in inside diameter, built continuously at the surface and jetted down to place. The bottom of this concrete well extends about 15 ft. below the low water level and the top is slightly above high water. To allow the water from the river to enter 5 in. drain pipes are set at close intervals through the wall and the seepage through the coarse sand and gravel is counted on to purify the water considerably for drinking purposes, although it probably will have little effect on its fitness for use in boilers. There are two electrically driven pumps with a capacity of 1,000,000 gal. in 24 hours which supply the water from this well to a 100,000 gal. storage tank at the yard and a similar tank for supplying the town which is planned for the employees.

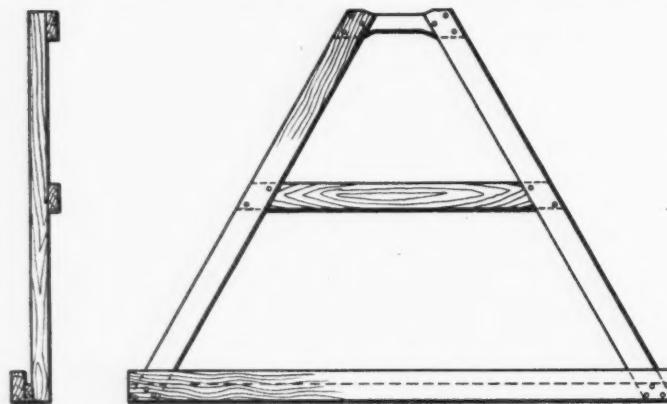
The company has provided a hotel and eating house with more than 100 rooms for the convenience of trainmen and employees in the yard and shops. This building is located at a convenient point adjacent to the yard.

This yard was built under the supervision of F. I. Cabell, chief engineer. E. Gray was the assistant engineer in direct charge of the construction work. Westinghouse Church Kerr & Company had the contract for the buildings, and D. A. Langhorne & Co., Lynchburg, Va., handled the grading.

#### A FRAME FOR CARRYING GLASS.

By C. H. THOMAS.

The accompanying sketch shows a simple frame for carrying panels of glass, which not only assists in protecting the glass,



A Frame for Carrying Glass.

but also reduces the danger of minor injuries to the men. This frame is readily made from any suitable timber.

**SUPPLIES FOR THE TRANS-AUSTRALIAN RAILWAY.**—The construction of the Trans-Australian Railway, as well as other new lines throughout the Commonwealth, entails the local manufacture of large quantities of materials and appliances, also the importation of a number of spare parts, rails, tools, etc. Engineering representatives, particularly the German and American, are active in trying to secure orders. Many ship loads of materials have been and are on their way to Fremantle and Port Augusta, the landing points for the Trans-Australian line. Two steamers have recently landed 8,000 tons of rails, being an installation of the order recently secured by American steel manufacturers.

## General News.

The Mobile & Ohio has increased the pay of locomotive engineers, the average rate of increase being somewhat less than 5 per cent.

The Delaware, Lackawanna & Western has ordered the abolition of pens and inkstands in telegraph offices and the use of indelible pencils instead.

The passenger station, freight house and grain elevators of the Lake Erie & Western, at Kokomo, Ind., were destroyed by fire on July 6, causing a loss estimated at \$60,000.

The Interstate Commerce Commission has requested Congress to appropriate \$1,500,000, in the deficiency bill now being prepared, to pay a part of the expenses for valuing the property of the railroads of the country.

At Kansas City, July 16, William LaTrasse, a train robber, was sentenced to from one to twenty-one years in the penitentiary for robbery of a Missouri Pacific passenger train between Leavenworth and Kansas City in December, 1910.

The Texas & Pacific has announced that, effective July 1, its operating department will adopt the divisional plan of organization. All train masters have been appointed assistant superintendents. The assistant superintendent, master mechanic, division engineer, road master and foreman of bridges and building will all report to the superintendent.

The Chicago railways have announced that all freight houses in Chicago will be closed at 3 p. m., instead of 4:30 p. m. on Saturdays during July and August, following the plan adopted last year. The railways were in favor of giving the men all of Saturday afternoon, but this was opposed by shippers on the ground that it gave other cities an advantage over them.

Among the laws passed by the last legislature of Maine and which are now in effect are an act to amend the laws of 1911 requiring railroads to pay their employees weekly, instead of fortnightly; an act providing that railroad companies shall screen the windows of smoking cars from May 1 to November 1, on cars running through forest sections; an act looking to the abolition of highway grade crossings, and an act to regulate the size and construction of cabooses.

R. C. Richards, chairman of the Central Safety Committee of the Chicago & North Western, is furnishing to all the moving picture shows along the line of the road a set of stereopticon views similar to those shown in its trespass circular, showing the manner in which so many people are killed and injured while trespassing on railroad tracks. One of the slides used shows a statement giving the number of persons killed and injured while trespassing in the last 20 years.

The new public utilities act in Maine, noticed last week, was rendered inoperative, as was expected, by the filing of a petition for referendum, containing more than 10,000 names. It is expected that Governor Haines will soon announce the date for a general election to decide on the matter. Friends of the measure are organizing, and it is said that they will test the right of proponents or opponents of a measure to purchase signatures to referendum petitions which, it is charged, has been done in this case. Meanwhile, the present railway commission will continue in power.

Floods in Central Ohio on July 14 and 15 are said to have done damage amounting to \$3,000,000, the rainfall at many places amounting to over 6 in., or an amount nearly equal to that which fell in the disastrous flood of last March. At Zanesville more than twenty bridges were reported washed away. The Muskingum river rose 15 ft. in eight hours. Near Marietta a passenger train of the Pennsylvania was surrounded by water so suddenly that passengers had to be rescued in boats, and some of them are said to have been taken out of the cars through holes cut in the roofs. The fire in the locomotive was quenched so quickly that the engineman was unable to back away from the flood. The contents of the mail car and the baggage car were submerged. At last accounts railroad traffic, interrupted in many places, had been mostly resumed.

The Chicago city council committee on railway terminals has adjourned until October 1, by which time it is expected the

report of J. F. Wallace on the various proposed plans for railway terminal location will be ready to be submitted. Mr. Wallace is now engaged in making a study of the various plans. The City Club has sent a letter to the mayor and the city council protesting because the committee selected only one engineering expert instead of a commission of three or more, and offering to pay a part of the expense of employing such a commission. The Union Station Company has published another page advertisement in the Chicago papers, quoting a large number of letters from prominent Chicago business men opposing the idea of a single central passenger terminal, and favoring the location proposed by the railways on the west side.

At a dinner at the Hotel Astor, New York City, July 9, about 150 railroad men celebrated the thirtieth anniversary of the opening of the first division of the New York, West Shore & Buffalo, now the River division of the New York Central. Representative railroad men from Maine to the Missouri Valley and from the South were in attendance. The guest of honor was Charles W. Bradley, seventy-five years old, who was the first of the minor employees to be made a general officer of the company. He is now the superintendent of telegraph of the Chesapeake & Ohio. Among those who made speeches were: John B. Kerr, vice-president of the New York, Ontario & Western; J. McCulloch, of the New York Telephone Company; F. E. Harriman, local traffic manager of the New York Central; J. H. Hustis, vice-president of the New York Central; C. D. McKelvey, inspector for the New Jersey Public Utility Commission; Ira A. Place, vice-president of the New York Central; Walter B. Pollock, manager marine department, New York Central, and Percy R. Todd, president of the Bangor & Aroostook.

#### Fourteen Passengers Killed in California.

A press despatch from Los Angeles, Cal., July 13, reports that in a rear collision on the line of the Pacific Electric Railway, at Vineyard station, near Los Angeles, on the evening of that day, fourteen passengers were killed and a large number injured, probably over 150. Three trains from the beach, bound for Los Angeles, had followed each other, one after the other, closely, when all three were stopped, for some reason not explained. The third train appears to have been started on an improper signal, or through misunderstanding, and it crashed into the second one. The conductor of the standing train claims that he waved a red lantern in ample time to stop the third one.

#### U. S. Safety Appliances Required in Canada.

The Board of Railway Commissioners for Canada issued, on July 9, a code of regulations requiring cars in the Dominion to be equipped with safety appliances corresponding to those called for by the standards prescribed by the Interstate Commerce Commission of the United States. All railroads in Canada are called upon to complete the necessary changes in their cars and engines by December 31, 1915. These rules refer to hand brakes, brake-steps, running boards, sill-steps, ladders, hand-holds, uncoupling levers, etc.

#### A Safety Exposition in December.

The first international exposition of Safety and Sanitation ever held in America will be held in New York City, December 11 to 20, 1913, under the auspices of The American Museum of Safety, 29 West Thirty-ninth street. Safety and health in every branch of industrial life, manufacturing trade, transportation, business and engineering, in all of their sub-divisions will be represented at this exposition. By a special act of Congress, exhibits from foreign countries are to be admitted free of duty. European employers have cut their accident and death rate in half by a persistent campaign for safety. There are 21 museums of safety in Europe. All of these will contribute to the exposition.

#### Disturbances Concerning Wages.

The demand of the conductors and brakemen which is being considered at New York is not the only news item concerning the pay of railroad employees. The Central Vermont, which is not a party to the negotiations in New York, has been called upon by its enginemen and firemen for an increase of 20 per cent. Officers of the brotherhood are conferring with the general manager at St. Albans. Last week it was reported that about

800 shopmen employed by the Philadelphia & Reading had been dismissed because of a strike; but on Tuesday of this week a press despatch from Washington says that Acting Commissioner Hangar from the Department of Labor has adjusted the strike of "several thousand carmen on the Philadelphia & Reading, acting in conjunction with the Pennsylvania State Bureau of Labor and Industry." At Philadelphia it is announced that the Reading has adjusted the pay of despatchers, yardmasters and agents, to put the rates of their pay on a parity with those of other classes, to whom increases have lately been granted. A press despatch from San Francisco, July 15, says that conductors, brakemen and yardmen on the electric lines of the Southern Pacific, on the east side of San Francisco bay, more than 5,000 men altogether, want increases in their pay, to put them on a level with the men of the same classes who are working on steam-operated lines. The unions of the employees are said to be taking a strike vote.

#### Promotion of Enginemen on the New Haven.

The New York, New Haven & Hartford has made public the following new order regulating the assignment of engineers to passenger trains:

"Engineers must not be permitted to operate passenger trains except under the following conditions:

"First: They must have two years' previous road experience for through trains and one year's previous road experience for local trains.

"Second: They must have a certificate showing that they have passed all of the required examinations, a watch certificate, and a certificate of competency based upon the personal observation and knowledge of the road foreman of engines and master mechanic and approved by the division superintendent. A copy of this certificate must be given to the engineer and a copy filed in the division records.

"Third: No engineer must be assigned to passenger trains without the prescribed service qualifications or certificate of competency, unless he is accompanied by a road foreman of engines or other competent employee, who will remain with, and be responsible for him until his competency is established.

"Fourth: No man will be promoted to the position, or employed as an engineer, or take rating as such, until he is furnished with the prescribed certificate of competency from the road foreman of engines and master mechanic and approved by the division superintendent; a copy of this certificate to be filed in the division records."

#### Trainmen's Wages.

The leaders of the conductors' and brakemen's brotherhoods, conferring in New York City, had with them on Saturday last about 900 representatives of the local organizations who, at the end of a long meeting, ratified the votes which had been taken authorizing the leaders to order a strike on the eastern railroads, if deemed necessary. No action was taken by the leaders, however, pending the conference held at Washington on Monday in the office of President Wilson; and at that conference an agreement was reached, concurred in by all interested, for the prompt passage of the Newlands bill, amending the federal arbitration law. Congress passed and the president signed this bill on Tuesday, the 15th. The bill was passed in substantially the form in which it was given in the *Railway Age Gazette* of June 13, two amendments inserted in the house having dealt only with details. The president expressed his intention of acting as soon as possible in the matter of appointing a commissioner of mediation and an assistant commissioner. On Monday, Elisha Lee, chairman of the railroad managers' committee, had notified the leaders of the employees that if the Newlands bill should be passed the managers would be willing to submit to arbitration all questions of rates of pay and working conditions.

It is hinted that when the matter of brakemen's wages comes up for discussion under an arbitration agreement the railroads will propose that the extra brakemen made necessary by full crew laws, shall be paid less than the men who have useful duties to perform.

A statement has been issued showing what conductors and trainmen receive on the New York Central. On through passenger trains running between New York and Buffalo, requiring from 165 to 194 hours per month, the pay is: Conductors, \$168

to \$189 per month; trainmen, \$94 to \$108 per month. Baggage-men working between New York and Buffalo, from 170 to 191 hours per month, receive from \$95 to \$122 per month. On division passenger runs, such as those between New York and Albany, Albany and Syracuse, and Syracuse and Buffalo, requiring from 162 to 251 hours per month, the pay is: Conductors, \$130 to \$163 per month; trainmen, \$74 to \$93 per month. In suburban service, such as that in the vicinity of New York City within the electric territory, requiring from 123 to 212 hours per month, the pay is: Conductors, \$125 to \$156 per month; trainmen, \$70 to \$89 per month. In through freight service, conductors are paid from \$100 to \$150 per month; brakemen from \$75 to \$100 per month.

On Wednesday the railroads and the labor leaders telegraphed from New York to President Wilson that they desired the services of the new Commissioner of Mediation as soon as practicable. Later the managers' committee notified the employees that the roads themselves would have some claims to lay before the proposed arbitration board, which claims are outlined as follows:

When a minimum day's wage is paid in any class of service it shall entitle the railroad to the full mileage or hours of service paid for.

In no case shall double compensation be paid.

For fixing the basis of compensation, i. e., whether passenger, through or local freight, yard, etc.—the same classification shall be applied to all members of the train crew.

All monthly guarantees shall be abolished.

That consideration be given to a reduction of existing rates of pay of yard brakemen and of passenger conductors and trainmen on long continuous runs where there is an opportunity to make excessive mileage in a limited number of hours.

Employees in two or more classes of service on continuous duty or under continuous pay shall be paid the rates applicable to the different services performed with a minimum equal to ten (10) hours at the lowest paid service.

On passenger and freight trains, where under extra crew laws, additional men are required, the rate of pay for all brakemen shall be 20 per cent. below rates established for brakemen on trains not affected by such laws.

The rates and rules awarded by this arbitration shall supersede rates and rules now in effect which are in conflict therewith.

#### Exhibitors at the General Foremen's Convention.

Among the exhibitors at the convention of the International Railway General Foremen's Association, held at the La Salle Hotel, Chicago, July 15-18, were the following:

American Steel Foundries, Chicago.—Models of couplers, Economy draft arms, brake beams, Vulcan truck, Susemihl roller side bearings, Davis cast steel wheels. Represented by W. C. Walsh and W. G. Wallace.

Anchor Packing Company.—Tauril sheet, superheat discs, general packings. Represented by E. C. Adams and J. B. Robb.

Ashton Valve Company, Boston, Mass.—Locomotive safety valves, steam, air and test gages, wheel pressed recording gage, gage testers and appliances. Represented by Jos. F. Gettrust.

Barco Brass & Joint Company, Chicago.—Flexible joints, roundhouse blower sets and washout connections. Represented by F. N. Bard.

Bettendorf Company, Davenport, Iowa.—Truck and composite underframe. Represented by J. G. Hope.

Bowser, S. F., & Company, Ft. Wayne, Ind.—Pumps and oil tanks. Represented by J. L. Handy.

Buda Company, Chicago.—Buda-Ross electric headlight. Represented by Mark A. Ross.

Carborundum Company, Niagara Falls, N. Y.—Carborundum and aloxite wheels and aloxite and carborundum cloths and valve grinding compounds. Represented by C. C. Schumaker, R. H. Hogg and A. H. Hanlon.

Celfor Tool Company, Buchanan, Mich.—Drills, reamers, flue cutters, boring tools, etc. Represented by W. Nochumson and C. O. Montague.

Chicago Pneumatic Tool Company, Chicago.—Air and electric drills, pneumatic hammers, speed recorders. Represented by C. E. Walker, P. F. Flaven, J. C. Campbell, J. L. Camby, C. B. Coates and Chas. H. Schumaker.

Cleveland Twist Drill Company, Cleveland, Ohio.—Twist drills and reamers. Represented by H. S. White.

Crane & Company, Chicago.—Pipe fittings, valves and safety valves. Represented by G. S. Turner.

Detroit Lubricator Company, Detroit, Mich.—Lubricators. Represented by A. D. Homard and R. H. Lindman.

Emery Pneumatic Lubricator Company, St. Louis, Mo.—Emery brake cylinder lubricant, automatic lubricators, packing leathers showing results. Represented by E. A. Emery and H. C. Miller.

Flannery Bolt Company, Pittsburgh, Pa.—Tate flexible staybolt. Represented by R. R. Davis.

Garlock Packing Company, Palmyra, N. Y.—Throttle, cab cock and air pump packing. Represented by J. P. Landreth.

Goldschmidt Thermit Company, New York.—Thermit welding compounds and sample welds. Represented by H. S. Mann, C. D. Young and H. D. Kelly.

Hunt-Spiller Manufacturing Corporation, Boston, Mass.—Gray irons for cylinder bushings, packing, valve gages, boxes, etc. Represented by J. M. Mourse and B. W. Ellett.

Independent Pneumatic Tool Company, Chicago.—New electric tools, new air turbines, small S. S. compound drills. Represented by Robert T. Scott, George Wilson, Fred. Passino and Harold Hendricks.

Jenkins Bros., New York.—Globe, Angle Y and check valves, standard medium pressure and extra heavy gates. Represented by B. J. Neely.

Jerguson Manufacturing Company, Boston, Mass.—Water gages. Represented by H. M. Waters.

Locomotive Superheater Company, New York.—Boiler tools and unit distributing Prosser gages. Represented by R. M. Osterman and F. A. Schaff.

McQuay-Norris Manufacturing Company, St. Louis, Mo.—Leakproof piston rings. Represented by H. G. Paro and C. R. Travis.

Manning, Maxwell & Moore, Inc.; Ashcroft Manufacturing Company; Consolidated Safety Valve Company; the Hancock Inspirator Company, New York.—Hancock inspirators, boiler checks, Consolidated safety valves, Ashcroft pressure gages, Prismatic water glasses and other locomotive appliances. Represented by C. L. Brown.

Mudge & Company, Chicago.—Mudge-Slater spark arrester. Represented by S. S. Lawson and G. W. Benden.

Nathan Manufacturing Company, New York.—Lubricators, water glasses and valves. Represented by A. S. Work and George Royal.

National Machinery Company, Tiffin, Ohio.—Single motor driven bolt cutter and die sharpener. Represented by Chas. Harmon, Jr., and K. L. Ernst.

O'Malley-Beare Valve Company, Chicago.—Multiplate, Globe, Angle, check and blowout valves. Represented by E. O'Malley and Thos. O'Malley.

Ohio Injector Company, Detroit, Mich.—Injectors, lubricators, flange oilers and boiler fittings. Represented by Wm. S. Furry, F. W. Edwards and A. C. Beckwith.

Pyle-National Electric Headlight Company, Chicago.—Electric headlights. Represented by Guy H. Matthews.

Racine Tool & Machine Company, Racine, Wis.—High speed metal cutting machines. Represented by J. M. Jones, W. L. Cande and Fred. Thonnis.

Ryerson, Joseph T., & Son, Chicago.—Model of a punch and boiler tools. Represented by L. H. Bryan, C. R. Gregg, H. C. Williamson and H. G. Merriell.

Skinner Chuck Company, New Britain, Conn.—Lathe and drill chucks, drill press vises, arbors. Represented by W. S. Rand.

Standard Tool Company, Cleveland, Ohio.—General line of drills, reamers, taps and milling cutters. Represented by Frank Arham.

Strong-Carlisle & Hammond Company, Cleveland, Ohio.—Randall graphite sheet lubricator, Mac-it set screws. Represented by H. P. Prescott, W. G. Yates and B. E. Carpenter.

#### American Society of Engineer Draftsmen.

At the last meeting of the American Society of Engineer Draftsmen, held in New York, July 17, William F. Turnbull of the American Locomotive Company, New York, gave a lecture on The Mathematics of Structural Steel Construction.

#### MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 19, 1914, St. Louis.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York. Annual meeting, October 14-15, Philadelphia, Pa.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—H. G. McConaughy, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York.

Next meeting, November 19, 1913, Chicago.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichy, C. & N. W., Chicago. Convention, October 21-24, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga. Next convention, July 22-24, Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wenlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Annual convention, October 18-24, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY & MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C. M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria; 2d Thursday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assoc.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Sups.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Fraenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Monday in month, except July and August, Chicago.

## Traffic News.

The Southwestern Passenger Association has announced that the sale of mileage books throughout the southwest will cease at once with the introduction of the two-cent fares.

The Denver & Rio Grande has announced that careful estimates indicate this year's output of the fruit growing section on the western slope of Colorado will approximate 12,000 carloads.

The secretary of agriculture has ordered a quarantine of the territory in the New England states infested with the gipsy moth and brown tail moth, under which Christmas trees and many other forest plant products can be transported out of the infested districts only after inspection by officers of the Department. By the terms of this order, lumber, ties, posts and poles will have to be inspected.

The western railways have announced that, on August 1, a team track storage charge assessed against shippers and consignees for failure to load or unload cars on team tracks within 48 hours, is to be made effective throughout the Western Trunk Line territory. Such a charge has been in effect in Chicago since August 1, 1912, and has resulted in a material decrease in the detention of cars. The charge is in addition to the demurrage, and is at the rate of \$1 per day for the first two days after the expiration of free time, and \$2 for each succeeding day.

The railroads in Official Classification territory have decided to at once file tariffs making a general advance of 5 per cent. in freight rates, both class and commodity, without waiting for the Interstate Commerce Commission's investigation, which is to come in the autumn. This action is taken in order to have a definite issue before the commission. The Central Freight Association has been in session this week in Chicago working out the details of the tariffs, and meetings of the Trunk Line Association have been held in New York for the same purpose. The rate makers are including the necessary adjustments to preserve the differentials between the Atlantic ports. It is hoped to make the tariffs effective September 1.

The National classification committee of lumber, wooden boxes and allied interests, representing six different associations, has filed with the Interstate Commerce Commission a petition asking the commission to rescind all rules and regulations in Western, Official, Southern and Transcontinental classifications which accord articles packed in fiber board, pulp board and corrugated board packages a parity of rating with articles shipped in wooden boxes. All of the railways that are members of the various classification committees are made defendants. This is the latest move in a long-drawn-out controversy between the makers of wooden boxes and those who make substitutes for wooden boxes, which was begun last year with the filing of a complaint by the R. W. Prudham Company of Los Angeles, against the transcontinental railways, which on eastbound shipments from California charge 25 per cent. higher rates on articles packed in fiber board boxes.

### Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association, in presenting statistical bulletin No. 147, giving a summary of car surpluses and shortages by groups from March 27, 1912, to June 30, 1913, says: The total surplus on June 30, 1913, was 70,740 cars; on June 14, 1913, 71,126 cars; and on July 4, 1912, 70,731 cars. Compared with the preceding period: there is a decrease in the total surplus of 386 cars, of which 188 is in flat, 43 in coal, 1,660 in miscellaneous, and an increase of 1,505 in box car surplus. The decrease in flat car surplus is in groups 2 (New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania), 7 (Montana, Wyoming, Nebraska and the Dakotas), 8 (Kansas, Colorado, Oklahoma, Missouri and Arkansas), 9 (Texas, Louisiana and New Mexico), 10 (Washington, Oregon, Idaho, California, Nevada and Arizona), and 11 (Canadian Lines). The decrease in coal car surplus is in groups 3 (Ohio, Indiana, Michigan and Western Pennsylvania), 4 (the Virginias and Carolinas), 5 (Kentucky, Tennessee, Mississippi, Alabama,

Georgia and Florida), 6 (Iowa, Illinois, Wisconsin and Minnesota), 7, 10 and 11 (as above). The decrease in miscellaneous car surplus is in groups 1 (New England Lines), 4, 9 and 10 (as above). The increase in box car surplus is in groups 2, 3, 6, 8 and 11 (as above).

The total shortage on June 30, 1913, was 7,036 cars; on June 14, 1913, 7,199 cars; and on July 4, 1912, 6,707 cars. Compared with the preceding period: there is a decrease in the total shortage of 163 cars of which 843 is in box, 163 in flat, and an increase of 788 in coal, and 55 in miscellaneous car shortage. The decrease in box car shortage is in groups 5, 6, 7 and 11 (as above). The decrease in flat car shortage is in groups 1, 4, 8, 10 and 11 (as above). The increase in coal car shortage is in groups 1, 2, 3, 6 and 10 (as above). The increase in miscellaneous car shortage is in groups 3, 8, 10 and 11 (as above).

Compared with the same date of 1912: there is an increase in the total surplus of 9 cars of which 5,023 is in box, 46 in flat, and

a decrease of 2,187 in coal and 2,873 in miscellaneous car surplus. There is an increase in the total shortage of 329 cars of which 1,785 is in coal, 29 in miscellaneous and a decrease of 1,099 in box and 386 in flat car shortage.

The accompanying table gives car surplus and shortage figures by groups for the last period covered in the report and the diagram shows total bi-weekly surpluses and shortages from 1907 to 1913:

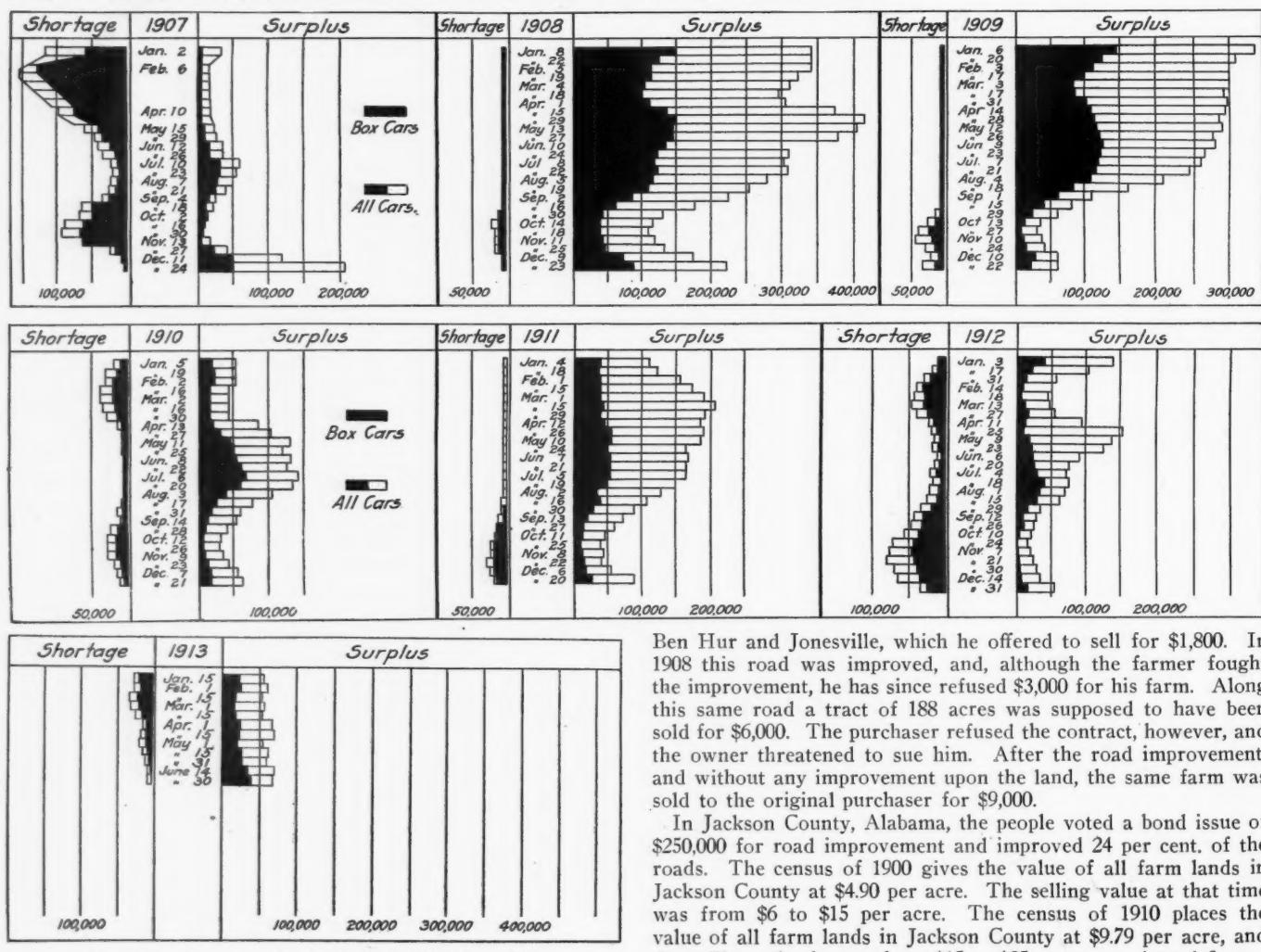
#### Good Wagon Roads Pay for Themselves.

This is the title of a statement issued by the Department of Agriculture showing where land values have increased in value after the improvement of a country road. The statement is based on information gathered by the Office of Public Roads. Among the illustrations cited are the following:

In Lee County, Virginia, a farmer owned 100 acres between

Date.	No. of roads.	CAR SURPLUSES AND SHORTAGES.					Shortages					Total.	
		Surpluses			Total.	Box.	Flat.	and hopper.	Coal,	gondola	Other		
		Box.	Flat.	and hopper.									
Group *1—June 30, 1913.....	7	491	668	189	1,404	1,302	110	334	0	0	746		
" 2—" " 30, 1913.....	35	1,097	20	1,003	2,780	0	0	692	0	0	692		
" 3—" " 30, 1913.....	32	4,367	193	1,422	2,369	831	149	302	64	596	596		
" 4—" " 30, 1913.....	13	3,109	244	878	4,729	339	509	1,111	30	1,989	1,989		
" 5—" " 30, 1913.....	28	1,291	0	300	2,499	59	410	150	0	619	619		
" 6—" " 30, 1913.....	33	5,159	207	1,771	3,827	10,964	276	52	161	36	525		
" 7—" " 30, 1913.....	5	289	19	118	409	63	0	0	0	0	63		
" 8—" " 30, 1913.....	21	7,548	342	2,423	3,858	14,171	377	18	61	44	500		
" 9—" " 30, 1913.....	15	1,004	297	342	595	2,238	4	0	4	25	33		
" 10—" " 30, 1913.....	21	6,563	970	2,609	7,056	17,198	72	30	6	89	197		
" 11—" " 30, 1913.....	7	3,767	124	0	1,680	5,571	789	192	0	95	1,076		
Total .....	217	34,685	3,084	11,055	21,916	70,740	2,362	1,470	2,821	383	7,036		

\*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California, Nevada and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages, 1907 to 1913.

Ben Hur and Jonesville, which he offered to sell for \$1,800. In 1908 this road was improved, and, although the farmer fought the improvement, he has since refused \$3,000 for his farm. Along this same road a tract of 188 acres was supposed to have been sold for \$6,000. The purchaser refused the contract, however, and the owner threatened to sue him. After the road improvement, and without any improvement upon the land, the same farm was sold to the original purchaser for \$9,000.

In Jackson County, Alabama, the people voted a bond issue of \$250,000 for road improvement and improved 24 per cent. of the roads. The census of 1900 gives the value of all farm lands in Jackson County at \$4.90 per acre. The selling value at that time was from \$6 to \$15 per acre. The census of 1910 places the value of all farm lands in Jackson County at \$9.79 per acre, and the selling price is now from \$15 to \$25 per acre. Actual figures



service is given at a flat rate per annum, they are offered only the various forms of limited-service contract which provide for a certain number of calls at a stated sum per annum, with additional calls at so much per call. The commission decided that in view of the fact that no charge is made or call recorded against either class of subscribers by respondent company for the local call used in connecting with the interstate line, and that therefore there is no discrimination with respect to interstate transmission, this is a controversy over which, upon the facts of this case, this commission has no jurisdiction. Proceeding discontinued. (27 I. C. C., 622.)

#### Joint Rates with the Washington Western.

*In re investigation and suspension of advances in rates by carriers for the transportation of lumber, shingles, and other articles from points located on the Washington Western Railway to points in Minnesota, Illinois, Indiana, and other states. Opinion by Commissioner Harlan:*

The cancellation of joint rates with a tap line incorporated by the proprietary lumber company for the purpose through that means of getting allowances out of the rates was sustained on a finding that with respect to the lumber of the proprietary company the tap line is a plant facility.

In a lumber-producing territory, where the rates apply in all other instances only from the trunk line junctions with tap lines, it does not necessarily follow that the protestant lumber company would be entitled to the group rates even if its tap line on the record was shown to be a full-fledged common carrier. The order of suspension was vacated. (27 I. C. C., 630.)

#### Grain Rates from Toledo.

*Toledo Produce Exchange v. Ann Arbor et al. Opinion by Commissioner Meyer:*

The Toledo Produce Exchange complains against the restrictions placed upon the forwarding of grain and grain products after transit at Toledo, Ohio, and asks for the establishment of reshipping rates, ex-lake rates, and export rates on grain and grain products on the usual basis of 78 per cent. of the corresponding Chicago-New York rates. The commission held that joint through rates with transit at Toledo should be established to cover the movement of grain and grain products by all reasonably direct routes to points in the east.

Domestic and export rates on ex-lake grain forwarded from Toledo to New York should be established in the relation of 78 from Toledo to 60 from Buffalo. The customary differentials to other destinations should be observed.

Export rates on grain and flour from Toledo to New York should be as 78 is to 60 for the export rates on grain and flour from Buffalo with the customary differentials to other north Atlantic ports. (27 I. C. C., 536.)

#### Coal Rates Discriminatory.

*Consolidated Fuel Company et al. v. Atchison, Topeka & Santa Fe et al. Opinion by Commissioner Harlan:*

The Denver & Rio Grande in competing commercially in interstate coal markets, through the operations of a coal company owned by it, not only violates the commodities clause of the act, but is guilty of an unjust rate discrimination against the complainants, in that the group rates apply only from its junction with the industrial lines of the complainants, while they are applicable directly from its own mines on its own branch lines, the latter being operated under general conditions substantially similar to those surrounding the operation of the industrial lines of the complainants.

Without entering an order, several forms of relief which the complainants may have under the circumstances of the case are indicated in the report, and the tariffs in question are required promptly to be adjusted in one form or other, the rate situation as readjusted to be maintained so long as the Denver & Rio Grande competes commercially in interstate markets with the complainants. (27 I. C. C., 554.)

#### Milk Rates Reduced.

*Dixie Dairymen's Association v. Yazoo & Mississippi Valley. Opinion by Commissioner Harlan:*

The complainant contends that the rate charged by the defendant for the transportation of milk in cans on passenger trains from points in Mississippi to New Orleans are excessive and un-

reasonable; that the rates are unduly discriminatory in that the charge on milk is the same as on cream, a more valuable commodity; and that the fourth section of the act is violated in existing schedule of rates. The commission found that no violation of the fourth section was shown in the record. The commission decided that the present rates on milk are unreasonable and prescribed reasonable rates for the future. The commission also urged the defendant to make a distinction between cream and milk, by charging somewhat higher rates on the former commodity than on the latter. (27 I. C. C., 618.)

#### Lumber Rates from Memphis and Other Points to New Orleans.

*In re investigation and suspension of advances in rates by carriers for the transportation of hard-wood and other kinds of lumber and articles manufactured therefrom from points in Arkansas, Louisiana, and other points to Memphis, Tenn., St. Louis, Mo., and other points of destination.*

The commission decided that the proposed advanced rate on lumber, staves, and heading from Memphis, Tenn., to New Orleans, La., was reasonable.

Those parts of the fourth-section application of the Illinois Central and the Yazoo & Mississippi Valley asking permission to charge lower rates on lumber, staves, and heading from Memphis to New Orleans than from intermediate points were denied.

The proposed advanced rates on lumber, staves, and heading from points on the Illinois Central and the Yazoo & Mississippi Valley between Memphis and the line of the Southern Railway in Mississippi were not justified in so far as they exceed 11 cents per 100 lbs.

The proposed advanced rates on these products from points on the Illinois Central and the Yazoo & Mississippi Valley south of the Southern Railway in Mississippi were not justified.

The proposed advanced rates on gum lumber from points on the Southern Railway in Mississippi were justified.

The proposed advances on gum lumber and staves from Helena and Arkansas City, Ark., were justified.

The proposed advanced rate from Alexandria, La., found not to have been justified in so far as it exceeds 8 cents per 100 lbs. (27 I. C. C., 471.)

#### Lumber Rates to Memphis, Tenn.

*Memphis Freight Bureau v. Illinois Central et al. Opinion by Commissioner Marble:*

Present rates on pine lumber to Memphis, Tenn., from Jackson, Miss., and points on the Illinois Central north thereof, found to be unreasonable in so far as they exceed 10 cents per 100 lbs.

Present rates on lumber, staves, and headings to Memphis, Tenn., from points south of the Alabama & Vicksburg Railway and east of the Mississippi river on the lines of respondents, except that of the New Orleans, Mobile & Chicago, were found to be unreasonable in so far as they exceed 11 cents for a haul over one line, or 12 cents for a haul over two or more lines.

Maintenance by the New Orleans, Mobile & Chicago of rates for the transportation of lumber and headings from points on its line to Memphis, Tenn., higher than the rates contemporaneously maintained by it for the transportation of staves between the same points was found to be unjustly discriminatory.

The proposed advances in the rates on lumber from points on the Illinois Central and the Yazoo & Mississippi Valley in Mississippi and Louisiana to Memphis, Tenn., were found not to have been justified in so far as they make rates in excess of those found reasonable.

The commission made no finding as to the rates to Memphis, Tenn., from Vicksburg and Jackson, Miss., and points north thereof, on lumber other than pine. (27 I. C. C., 507.)

#### Sioux City Not Discriminated Against.

*Sioux Terminal Elevator Company et al. v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner Clements:*

The findings in original report that defendants are not subjecting Sioux City, its traffic and shippers, to undue prejudice and disadvantage because they refuse to establish and maintain a basis of proportional rates on grain from Sioux City to Chicago and other markets in lieu of the present basis of joint through rates from points of origin to final destination with transit privileges at Sioux City, while contemporaneously main-

taining such a basis of proportional rates from Omaha and Kansas City to the same ultimate markets, adhered to.

The difference in competitive conditions affecting the traffic in grain through Sioux City from the competitive conditions affecting similar traffic through Omaha and Kansas City was further discussed. In considering the lawfulness of rate adjustments the commission cannot treat all carriers within its jurisdiction as if they were embraced in one united system, or deal with complaints against existing rates as matters alone of general policy in which it may exercise a wide discretion in the equalization of all disadvantages between markets, but it must give full recognition to the separate organizations and obligations of individual carriers and to the effect of substantial differences in circumstances and conditions in the determination of whether the granting or withholding of a given rate or practice is unduly preferential or prejudicial against the complaining locality. (27 I. C. C., 457.)

#### Wheat Rates from Chicago and Minneapolis.

*Board of Trade of the City of Chicago v. Chicago & Alton et al.*

The proportional rate of 10 cents per 100 lbs. on wheat from Minneapolis to Chicago was found to be neither unreasonable nor unjustly discriminatory.

An arrangement under which Minneapolis pays 25 cents on flour to the east and to central freight association territory, while Chicago must pay 10 cents more than Minneapolis for its wheat and 16.7 cents east on its flour, a total of 26.7 cents, is unjustly discriminatory and the discrimination should be removed.

Milling in transit is established to give to the miller the benefit of the through grain rate which he could not otherwise obtain. If rival mills may procure their wheat from the same producing points at the same through rate, the principle is satisfied, and one miller should not expect to enter another milling point and reship the raw material there found to his own mill on an equality with the miller by whom the raw material has been accumulated. And so held with respect to an adjustment of rates under which Chicago can ship direct from points of production at rates as low or lower than Minneapolis, but can not draw from Minneapolis certain wheat there accumulated and reship to Chicago on the same basis as the Minneapolis miller.

Chicago's failure to attract wheat in the same volume as Minneapolis is a disadvantage due to commercial rather than transportation conditions and is not chargeable to the defendants.

Wheat, on the one hand, and barley, rye, oats, and other coarse grains, on the other, do not constitute such "like traffic" that a different charge for their contemporaneous transportation is violative of section 2. (27 I. C. C., 530.)

#### Commodity and Class Rates from Pittsburgh.

*Koehler Produce Company et al v. Pennsylvania Railroad, et al. Opinion by Commissioner Clements:*

In this case the rates on general produce from Pittsburgh, Pa., to stations west and south of that city on the lines of the Baltimore & Ohio and the Pennsylvania Lines West, are attacked as unreasonable. The destinations in issue are within a radius of about 80 miles from Pittsburgh. Prior to 1909 the defendants published special commodity rates on produce to these destinations, applicable on either straight or mixed carloads. In 1909 both the Baltimore & Ohio and the Pennsylvania Lines West cancelled these rates, thereby restoring the class rate basis applicable on the individual commodities constituting the mixed carloads. The Pennsylvania Railroad and the Baltimore & Ohio now publish commodity rates to stations on their lines east of Pittsburgh upon the same relative basis as were the commodity rates to the points west of Pittsburgh, which were cancelled. The complainant contends that under this arrangement the stations west and south of Pittsburgh are discriminated against in favor of those east. The commission decided that the class rates from Pittsburgh to stations west and south of that city are not unreasonable in themselves, but are prejudicial against the complainant in favor of shippers under the commodity rates to points east of Pittsburgh. No order was entered, but the defendants will be expected to remove this discrimination. Reparation was asked, but was denied. (27 I. C. C., 635.)

#### STATE COMMISSIONS.

The Missouri Public Utilities Commission has denied the application of the Missouri River & Bonne Terre for permission to retain the three-cent fare, pending an investigation, and the road has put the two-cent rate into effect.

The California State Railroad Commission, in a recent decision, holds that it possesses the authority to regulate the rates of transportation on steamships plying over regular routes from one port to another within the state, even though the vessels traverse the high seas.

The newly established Public Service Commission of Massachusetts, succeeding to the duties of the Railroad Commission, has been organized by the choice of F. J. MacLeod as chairman. The office of the commission is at 20 Beacon street, Boston, and the secretary is Charles E. Mann.

The Railroad Commission of Alabama recently issued an order requiring the Alabama, Tennessee & Northern to reduce passenger fares to the basis of 3 cents a mile, the order to go into effect July 15; but, on application of the road for a re-hearing, the order has been suspended for thirty days.

The nominations of Messrs. Chase and Leffingwell, as members of the New York State Public Service Commission, Second district, announced last week, have not as yet been confirmed by the Senate. Chairman Frank W. Stevens resigned his place on the commission in May and on July 1, Commissioner M. S. Decker was named chairman. The secretary of this commission is Frank H. Mott.

The Public Utilities Commission of Connecticut has issued a report on the rear collision which occurred at Stamford, June 12, and lays the responsibility on the engineman of the second section. The report embraces conclusions substantially the same as those of the Interstate Commerce Commission, noticed elsewhere, except that there is a further recommendation that enginemens should be frequently examined to determine their fitness.

The Public Service Commissions of New York, each in its own district, now have authority over stage routes and omnibus lines, under certain conditions, such conveyances being declared common carriers by a law, chapter 495, passed by the legislature on May 14. The law applies to stages and omnibuses running wholly or partly on a "state route" highway; or on any highway built wholly or partly at the expense of the state, or any highway, avenue, or public place in a city of the first class having 750,000 population, or less. These carriers must secure a certificate of convenience and necessity, as is required in the case of other common carriers. If the road has been built partly at the expense of a railroad or street railroad corporation the commission may require the stage line to contribute towards its maintenance.

#### COURT NEWS.

The Appellate division of the Supreme Court of New York, in a decision handed down July 10, sustains the order of the Public Service Commission, requiring the Brooklyn Rapid Transit Company to equip its surface street cars with power brakes and geared hand brakes. It is estimated that the cost of the changes required by the order will be \$500,000, and the company has been resisting the order in the courts for about two years.

The attorney general of Texas has filed an amendment to the suit recently filed in the district court at Austin, which attacked the recent consolidation of the Texas lines of the Missouri, Kansas & Texas system as a violation of the anti-trust law. The amendment makes the Missouri, Kansas & Texas Railway, the Kansas corporation, a party to the suit, and seeks to recover penalties for alleged violations of the Texas anti-trust statutes. It is alleged that the Missouri, Kansas & Texas, the Missouri, Kansas & Texas of Texas, the Dallas, Cleburne & Southwestern, the Denison, Bonham & New Orleans, and the Texas Central have each violated the statute for about 1,130 days; that the Beaumont & Great Northern has violated it for about 304 days, and other defendant roads for about 659 days each.

— 22 — AND EXPENSES OF RAILWAYS.

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## DEVENIES AND EXPENSES OF RAILWAYS.

— EIGHTY MONTHS OF FISCAL YEAR, 1913—(CONTINUED).

— EIGHTY MONTHS OF FISCAL YEAR, 1913—(CONTINUED).

## Railway Officers.

### Executive, Financial and Legal Officers.

Henry J. Horn, vice-president of the Boston & Maine at Boston, Mass., has resigned, effective August 1.

E. N. Brown, president of the National Railways of Mexico, at City of Mexico, Mexico, has resigned, and his resignation has been accepted.

T. D. Heed, assistant secretary and assistant treasurer of the Chicago & Eastern Illinois at New York, has been appointed assistant treasurer for the receivers, with office at New York City.

J. F. Meyer, assistant general manager of the Oregon-Washington Railroad & Navigation Company, has been appointed assistant treasurer, with office at Portland, Ore., succeeding R. Lea Barnes, resigned; effective July 1.

D. C. Douglass, assistant to vice-president and general manager of the Maine Central at Portland, Me., has been appointed assistant to the president of the Maine Central, the Portland Terminal Company, the Sandy River & Rangeley Lakes, the Bridgton & Saco River, and the Ricker Hotel Company.

Edward T. Jeffery, president of the Western Pacific at New York, has been elected chairman of the board and B. F. Bush, president of the Missouri Pacific and the Denver & Rio Grande, at St. Louis, Mo., has been elected president also of the Western Pacific, succeeding Mr. Jeffery. E. L. Brown, vice-president of the Denver & Rio Grande, at Denver, Colo., has been elected vice-president also of the Western Pacific, succeeding Charles H. Schlacks, resigned. Mr. Brown's headquarters will be at San Francisco, Cal.

### Operating Officers.

C. A. Wright has been appointed terminal trainmaster of the Chicago & Alton at East St. Louis, Ill.

S. A. Morrison has been appointed assistant superintendent of the Wisconsin division of the Chicago & North Western, instead of superintendent as stated in our issue of June 27.

John E. Church, trainmaster of the Pere Marquette at Saginaw, Mich., has been appointed trainmaster of the Delaware, Lackawanna & Western, with headquarters at Port Morris, N. J.

R. Colclough, assistant to general superintendent of the Intercolonial Railway at Moncton, N. B., has been appointed superintendent of the Montreal and Ste. Flavie district, with office at Levis, Que., succeeding D. McDonald, transferred.

Alfred Price, general superintendent of the Alberta division of the Canadian Pacific at Calgary, Alta., has been appointed assistant general manager, with office at Montreal, Que. The office of general superintendent of transportation has been abolished.

J. Q. Van Winkle, general manager of the Cleveland, Cincinnati, Chicago & St. Louis, at Cincinnati, O., has been appointed assistant to Vice-President J. J. Bernet, with office at Cincinnati. H. A. Worcester, assistant general manager, succeeds Mr. Van Winkle as general manager, also with office at Cincinnati; effective July 10.

Walter S. Williams, superintendent of the Minnesota division of the Illinois Central at Dubuque, Iowa, has been appointed superintendent of the St. Louis division, with offices at Carbondale, Ill., succeeding J. J. Gaven, granted leave of absence, and Lawrence A. Downs, superintendent of the Iowa division at Fort Dodge, Iowa, succeeds Mr. Williams as superintendent of the Minnesota division at Dubuque, Iowa.

J. A. Hillis, trainmaster of the Texas & Pacific at El Paso, Tex., has been appointed assistant superintendent of the Ft. Worth sub-division, including Baird yard, with headquarters at Baird, Tex., in place of E. Wilson, assigned to other duties. W. H. Homan, trainmaster at Big Spring, Tex., has been appointed assistant superintendent of the Baird, Big Spring and Toyah sub-divisions, with office at Big Spring. The office of assistant trainmaster at Ft. Worth, Tex., is abolished.

C. D. Baker, passenger trainmaster, electrified lines of the Long Island, at Brooklyn, N. Y., has been appointed to the new position of trainmaster, with office at Jamaica. The passenger trainmaster, electrified lines, passenger trainmaster, steam lines, and the freight trainmaster will report to the trainmaster. The positions of assistant trainmaster, day, and assistant trainmaster, night, have been abolished. C. H. Risley has been appointed passenger trainmaster, electrified lines, succeeding Mr. Baker. H. E. Lewis, chief train dispatcher, has been appointed passenger trainmaster, steam lines, succeeding W. L. Jarvis, assigned to other duties, and J. M. Magee succeeds Mr. Lewis.

J. O. Bell, whose appointment as superintendent of the Illinois division of the Chicago & Eastern Illinois, with headquarters at Salem, Ill., has already been announced in these columns, began railway work as a telegraph operator for the Pittsburgh, Ft. Wayne & Chicago at Delphos, Ohio. One year later he went to the Toledo, Peoria & St. Louis as chief clerk to the division superintendent, remaining in that position four years. He then was employed by the Illinois Central as train dispatcher on the Chicago, Madison & Northern division at Rockford, Ill., for three years, leaving to go to the Milwaukee, Lake Shore & Western as train dispatcher at Ashland, Wis. Later he was with the Southern Indiana as chief clerk to the general superintendent, chief train dispatcher and trainmaster. Mr. Bell entered the service of the Evansville & Terre Haute now a part of the Chicago & Eastern Illinois in 1906 as trainmaster. In 1910 he was promoted to superintendent, and continued as superintendent of the Evansville division of the Chicago & Eastern Illinois after the Evansville & Terre Haute was absorbed by the former road until June 15, when he was transferred to the superintendency of the Illinois division, as above noted.

R. C. Watkins, who on July 1 became superintendent of the Houston division of the Galveston, Harrisburg & San Antonio, with headquarters at San Antonio, Tex., was graduated in civil

engineering from the Agricultural and Mechanical College of Texas in 1895. From September, 1895, to January, 1897, he was with the Harriman Lines in Texas as track laborer, track walker and assistant yard foreman. He was then with the Juarez Construction Company, building 50 miles of the Rio Grande, Sierra Madre & Pacific in Mexico, leaving that company in May, 1898, to go with the Edison Electric Company of New Orleans as engineer. Mr. Watkins returned to active railway service in January, 1899, as assistant engineer of construction and maintenance

of the Louisiana Western and Morgan's Louisiana & Texas Railroad & Steamship Company. From June, 1902, to June, 1904, he was successively resident engineer of the Harriman Lines at San Antonio, Tex., and office engineer at Houston, Tex. He was then made right of way agent of the Harriman Lines in Texas and Louisiana, which position he held until June of this year, when he was promoted to acting superintendent of the Houston division of the Galveston, Harrisburg & San Antonio, one of the lines of the Sunset Route of the Southern Pacific. The appointment was made permanent July 1, as above noted.

Vice-President and General Manager J. P. O'Brien of the Oregon-Washington Railroad & Navigation Company, announces that effective July 1 the offices of assistant general managers are abolished and the following appointments made: M. J. Buckley, general superintendent, with headquarters at Portland, Ore.; C. G. Sutherland, assistant to general manager, with office



R. C. Watkins.

at Portland; J. L. Brass, assistant to general manager, with office at Seattle, Wash.; E. A. Klippel, superintendent of telegraph, and S. A. Hering, car service agent, both with headquarters at Portland. The operating divisions of the company will be as follows: First division, comprising the Northern division lines and that portion of Oregon division lines, Umatilla and west; Second division consisting of that portion of Oregon division lines east of Umatilla; Third division, including the lines now designated as Yakima division; Fourth division, comprising the lines now designated as the Washington division; Fifth division, including the lines now designated as the Ilwaco division and Water lines. J. D. Stack, heretofore assistant general manager, is appointed superintendent of the first division, with headquarters at Portland. W. Bollons is appointed superintendent of the Second division, with office at LaGrande, Ore. The following officials will have jurisdiction over the entire First division, with headquarters at Portland: W. H. Guild and W. M. Jaekle, assistant superintendents; A. B. Moore, division storekeeper. J. D. Matheson is appointed an assistant superintendent of the First division, with office at Portland. The office of assistant superintendent at Seattle is abolished.

#### Traffic Officers.

R. E. Hightower, Jr., has been appointed soliciting freight agent of the Macon & Birmingham, with office at Thomaston, Ga.

Leroy G. Smock, secretary to Vice-President MacMillan of the St. Paul & Kansas City Short Line, has been appointed division freight agent, with headquarters at Des Moines, Ia.

A. C. Shaw, assistant general passenger agent of the Canadian Pacific western lines at Winnipeg, Man., has been appointed general passenger agent, with office at Winnipeg, succeeding C. B. Foster, transferred to Montreal. R. G. McNeillie, district passenger agent at Calgary, Alta., succeeds Mr. Shaw and Robt. Dawson succeeds Mr. McNeillie.

H. P. Hewes has been appointed division freight agent of the Western Maryland, with office at Hagerstown, Md., succeeding T. H. McKoy, resigned. T. T. Adams has been appointed traveling freight and passenger agent, with office at Norfolk, Va. R. B. Machmer has been appointed traveling freight agent, with headquarters at Reading, Pa., and George J. Davis has been appointed soliciting freight agent, with office at Philadelphia, Pa.

Edward M. Kain, division freight agent of the Erie at Elmira, N. Y., has been appointed assistant general freight agent, with headquarters at Buffalo, succeeding Herbert Thompson, resigned to engage in other business. George C. Manning, division freight agent of the New York and the Delaware divisions, at New York, succeeds Mr. Kain. George R. Wheeler, division freight agent of the New York, Susquehanna & Western, at New York, succeeds Mr. Manning, and Lester R. Knapp has been appointed division freight agent, succeeding Mr. Wheeler.

F. W. Parsons, manager of the Eastern & Southern Despatch, has been appointed manager of eastern agencies (all rail) of the Southern Railway with headquarters at Philadelphia, and G. H. Kerr at Pittsburgh, Pa., W. M. Israel at Rochester, N. Y., Robert Mayo, Jr., at Philadelphia, Pa., and D. L. Taylor at Boston, Mass., formerly agents of the Eastern & Southern Despatch, are now commercial agents of the Southern Railway at the same places, and exclusive agencies of the Eastern & Southern Despatch Line are discontinued. The Eastern & Southern Despatch Route is not affected by this change. Southern Railway representatives will continue to handle the business of that despatch line under the supervision of Mr. Parsons.

C. A. Russell, commercial agent of the Southern Railway at Charlotte, N. C., has been appointed commercial agent at Memphis, Tenn. H. A. Parker succeeds Mr. Russell. R. H. McDonald, freight soliciting agent at Columbia, S. C., has been appointed commercial agent, with office at Columbia, and his former position has been abolished. C. D. Brown, traveling freight agent at Abbeville, S. C., has been appointed commercial agent, with office at Greenwood, S. C., and his former position has been abolished. S. H. Wiles has been appointed traveling freight agent, with office at Pittsburgh, Pa. I. I. Norris has been appointed traveling freight agent, with office at Rochester, N. Y., and W. S. Fargo has been appointed freight soliciting agent, with office at Augusta, Ga., succeeding F. E. Harrison, transferred.

#### Engineering and Rolling Stock Officers.

Lee Barnes has been appointed assistant roadmaster of the St. Paul division of the Northern Pacific.

H. J. Osborne has been appointed superintendent of motive power of the South Dakota Central, with headquarters at Sioux Falls, S. D.

The office of master car builder of the Missouri, Kansas & Texas at Sedalia, Mo., heretofore held by W. A. Mitchell, has been abolished.

C. B. Daily, assistant superintendent of shops of the Chicago, Rock Island & Pacific, at Silvis, Ill., has been appointed master mechanic on the Cedar Rapids division, with headquarters at Cedar Rapids, Iowa, succeeding F. W. Williams, transferred.

F. S. Robbins, assistant general foreman, at the Pitcairn, Pa., car shops of the Pennsylvania Railroad, has been appointed assistant master mechanic, Pittsburgh division, with headquarters at Pittsburgh, succeeding C. D. Porter, promoted. J. H. Thomas, foreman at the Mifflin shops, succeeds Mr. Robbins.

G. H. Dryden, assistant signal engineer of the Baltimore & Ohio, at Baltimore, Md., has been appointed principal assistant signal engineer, with headquarters at Baltimore, and R. W. Taylor, assistant engineer at Baltimore, has been appointed assistant signal engineer, with headquarters at Baltimore.

P. T. Dunlop, mechanical superintendent of the Gulf, Colorado & Santa Fe, has been appointed general superintendent of motive power of the St. Louis & San Francisco, with headquarters at Springfield, Mo., succeeding George A. Hancock, who has resigned on account of ill health. Effective August 1.

J. F. Graham, assistant general manager of the Oregon-Washington Railroad & Navigation Company, has been appointed superintendent of motive power, and J. T. Langley, assistant general manager, has been appointed assistant superintendent of motive power, both with headquarters at Albina shops, Portland, Ore. Effective July 1.

R. S. Stephens, chief engineer of the Missouri Pacific system, having been assigned to duties in connection with the valuation of railways by the Interstate Commerce Commission, C. E. Smith, bridge engineer, has been appointed assistant chief engineer, with headquarters at St. Louis, Mo., and will temporarily assume the duties of the office of chief engineer.

W. H. Scribner has been appointed supervisor of mechanical examinations of the Lake Shore & Michigan Southern, the Dunkirk, Allegheny Valley & Pittsburgh, the Chicago, Indiana & Southern and the Indiana Harbor Belt, with headquarters at Cleveland, Ohio, having direct assignment of duties in the examination of locomotive firemen for promotion, also for instruction of locomotive firemen at times not conflicting with examinations.

G. A. Hull, who recently was appointed superintendent of the car department of the Chicago, Rock Island & Pacific at Blue Island, Ill., has been appointed acting assistant mechanical engineer, with headquarters at Silvis, Ill., to succeed G. W. Lillie, who has been appointed acting mechanical superintendent of the Second district, with headquarters at Topeka, Kan., in place of C. M. Taylor, who has been granted a leave of absence due to illness. Effective July 10.

The Western Maryland announces that on July 15 the title of engineer maintenance of way was abolished, and for maintenance purposes the system has been divided into three divisions, as follows: Maryland division embracing all lines east of P. V. Junction, in charge of J. M. Harris, division engineer, with headquarters at Hagerstown, Md., succeeding J. Carmichael, assigned to other duties in the chief engineer's office. Cumberland division embracing all lines between P. V. Junction and Connellsville, Pa., including Knobmount yard, in charge of W. C. Kline, division engineer, with headquarters at Cumberland, and West Virginia division embracing all lines between Knobmount yard and Belington, W. Va., in charge of P. Cain, division engineer, with headquarters at Elkins.

G. W. Boschke, heretofore assistant general manager of the Oregon-Washington Railroad & Navigation Company, has been appointed chief engineer, with jurisdiction over the first division, south of the Columbia river, the second, third, fourth and fifth divisions, and construction work in progress adjacent to such lines, with the exception of the Spokane Union Ter-

minal, with headquarters at Portland, Ore. J. R. Holman, heretofore assistant general manager, has been appointed chief engineer, with jurisdiction over the first division, north of the Columbia river; also construction of Spokane Union Terminal and line westerly to Summit boulevard, Spokane, with headquarters at Seattle, Wash. H. L. Lyon has been appointed division engineer of the second division, with office at LaGrande, Ore. The jurisdiction of R. C. Charlton, signal supervisor, is extended to cover the entire first division.

#### Purchasing Officers.

J. H. Best has been appointed division storekeeper of the Second division of the Oregon-Washington Railroad & Navigation Company, with office at LaGrande, Ore. Effective July 1.

W. L. Cooper, division storekeeper of the Mobile & Ohio at Murphysboro, Ill., has been appointed division storekeeper at Jackson, Tenn., succeeding W. C. Blake, transferred. R. O. Woods, division storekeeper at Meridian, Miss., succeeds Mr. Cooper, and D. E. Moodie has been appointed division storekeeper at Meridian, Miss., succeeding Mr. Woods.

William P. Hawkins has been appointed assistant fuel agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, with headquarters at St. Louis, succeeding W. J. Jenkins, resigned to become vice-president and general manager of the Consolidated Coal Company. Mr. Hawkins heretofore has been claims assistant in the office of Vice-President E. J. Pearson.

#### OBITUARY.

G. McRoberts, division foreman of the St. Louis & San Francisco at Salem, Mo., died on July 10, aged 56 years.

Paul R. MacKinnon, traveling passenger agent of the Chicago, Rock Island & Pacific at Denver, Colo., died recently at that place.

Henry Martyn Thompson, one of the first three railroad commissioners of the state of New York, died on Monday, July 14, at his home in New York at the age of 71.

Daniel Smith Newhall, purchasing agent of the Pennsylvania Railroad, died on July 13 in a hospital at Philadelphia. He was born on April 7, 1849, at Germantown, Philadelphia. On February 21, 1882, he was elected assistant secretary of the Pennsylvania Railroad, and since June 1, 1898, was purchasing agent of the same road, with office at Philadelphia.

David S. Hill, formerly from April, 1882, to February, 1900, general superintendent of the Lake Erie & Western at Indianapolis, Ind., died on July 1 at Detroit, Mich., aged 72 years. Mr. Hill began railway work in 1858, and filled various minor positions with the Michigan Central and Louisville, New Albany & Chicago until September, 1871, when he became assistant superintendent of construction of the Cincinnati, Lafayette & Chicago. Later he was trainmaster and superintendent of the Lafayette, Bloomington & Muncie until April, 1880, when he was made division superintendent of the Lake Erie & Western. In April, 1882, he was promoted to general superintendent, which position he held until February, 1900, when he was appointed assistant chief engineer of that road. He retired from active railway service in January, 1901.

Dr. William Taussig, president of the St. Louis Bridge Company, director of the St. Louis Union Trust Company and organizer and former president of the Terminal Railroad Association of St. Louis, died on July 10, of pneumonia, after an illness of several weeks, at his home in St. Louis, Mo., at the age of 87. He was born in Bohemia and was graduated from the University of Prague in 1844. He came to St. Louis a year later and was graduated in 1850 from the St. Louis School of Medicine. He was an active practitioner for thirteen years. In 1852 he was elected mayor of Carondelet. He served as judge of the St. Louis County Court from 1859 to 1865 and from 1863 to 1865 was the presiding judge. In 1866 he became president of the Traders' Bank. He was one of the organizers of the St. Louis Bridge Company, which built the Eads bridge, and of the Terminal Railroad Company. He was president of the Terminal Railroad Association from its organization in 1889, until 1896.

## Equipment and Supplies.

#### LOCOMOTIVE BUILDING.

THE EL PASO & SOUTHWESTERN has ordered 5 mikado locomotives from the American Locomotive Company. These locomotives will be equipped with superheaters, will have 29 in. x 30 in. cylinders, 63 in. driving wheels, and in working order will weigh 325,000 lbs.

THE CHICAGO JUNCTION RAILWAY has ordered 5 six-wheel switching locomotives from the American Locomotive Company. These locomotives will be equipped with superheaters, will have 20 in. x 26 in. cylinders, 51 in. driving wheels, and in working order will weigh 149,000 lbs.

#### CAR BUILDING.

THE DENVER & SALT LAKE is said to have ordered 175 freight cars from the Pullman Company. This item has not been confirmed.

THE EL PASO & SOUTHWESTERN has ordered 500 automobile cars, 200 stock cars and 200 gondola cars from the Standard Steel Car Company.

THE SOUTHERN RAILWAY, mentioned in the *Railway Age Gazette* of June 27 as having ordered 250 hopper cars from the Pressed Steel Car Company, has increased the order with that company to 345 hopper cars, and has ordered 100 hopper cars from the Lenoir Car Works. All of these cars will be of 100,000 lbs. capacity and will weigh 37,500 lbs. The inside dimensions will be 30 ft. long, 9 ft. 6 in. wide and 9 ft. high. The overall dimensions will be 31 ft. 10 in. long, 10 ft.  $\frac{1}{2}$  in. wide and 10 ft. high. Some of the special equipment will be as follows:

Body—Steel.	Door Fastenings—Enterprise Railway Equipment Co.
Underframe—Steel.	Draft gear—Miner.
Bolsters, body—Steel, built in.	Dust guards—Harrison.
Brakes—Westinghouse.	Journal boxes—Gould.
Brake beams—Waycott.	Side bearings—Cast on bolster.
Brake shoes—Perfecto, steel back.	Springs—Pittsburgh Spring & Steel Co.
Brasses—Ajax.	Trucks—American Steel Foundries.
Couplers—Buckeye.	Wheels—M. C. B.
Doors—Four.	

#### IRON AND STEEL.

GENERAL CONDITIONS IN STEEL.—It is estimated that there has been a falling off of about 5 per cent. in mill operation since the latter part of June. A shrinkage in operations in July and August was to be expected, but the falling will be due as much to a decrease in specifications as to the hot weather. Many manufacturers believe that there will be a revival in the buying movement beginning in the fall, but doubt is expressed as to the ability of the steel industry to produce as large a tonnage in the last half of the year as in the first half.

#### SIGNALING.

##### Automatic Block Signals on the Canadian Pacific.

The Hall Switch & Signal Company has recently taken contracts for the construction of automatic block signals on 47 miles of the Canadian Pacific as follows: Montreal Junction to Iberville, 27 miles, double track; Markstray to Stinson, 11 miles, single track; Renfrew to Egansville, 6 miles, single track; at Mattawa, 3 miles, single track. Switch indicators will be used in all of these installations, and the signals will be style K, top post, normal danger.

The Canadian Pacific already has about 150 miles of its lines equipped with Hall automatic block signals, all normal danger, as follows: St. John to Vanceboro, 90 miles; West Toronto to Bolton, 21 miles, and Streetsville Junction to Islington, 13 miles, all single track but 1 mile; and Ste. Therese to Place Viger, 20 miles, and Romford to Sudbury, 7 miles, double track.

## Supply Trade News.

The General Electric Company, Schenectady, N. Y., has opened a branch office at Madison, Wis.

Fred Lavis, consulting engineer, who has been located in Argentina for the past 18 months, has returned to make his headquarters at his office at 50 Church street, New York.

The U. S. Metal & Manufacturing Company, New York, has recently added to its line of railway specialties, the sale of the Lincoln arc welding and cutting machines, made by the Welding Materials Company.

The H. W. Johns-Manville Company, New York, has opened a branch office in the Commercial Bank building, Charlotte, N. C., in charge of E. U. Heslop as manager. P. J. McCusker and Paul W. Whitlock are also located at that office.

The Independent Pneumatic Tool Company, Chicago, has moved its motorcycle manufacturing department from its plant at Aurora, Ill., to a new plant in Chicago, to permit further expansion in the manufacture of its Thor air and electric tools. The output of the Aurora plant will be increased to 1,500 air tools and 500 electric drills per month.

A fire broke out on Saturday night, July 12, in the lumber yards of the Haskell & Barker Car Company at Michigan City, Ind., and for a time threatened to destroy the entire plant and a large part of the city. Several million feet of lumber was destroyed, causing a loss which has been estimated at over \$500,000, but the fire was controlled before it extended to other parts of the plant.

The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has sold to Kuhn, Loeb & Company, New York, \$3,250,000 6 per cent., two-year notes, due August, 1915, to provide for the retirement of the \$4,000,000 6 per cent., three-year notes due August 1, next. The remaining \$750,000 will be paid out of the treasury of the company. A cash payment of \$10 for each \$1,000 note will be paid to the holders of the old notes who exchange them for new notes.

District Judge Thomas I. Chatfield, sitting in the United States district court for the Eastern district of New York, handed down a decision on June 12 in *Heinrich L. I. Siemund vs. Joseph Enderlin, Sr., and Joseph Enderlin, Jr., doing business under the firm name and style of Joseph Enderlin, Jr., & Co.*, dismissing the complaint against the defendants for infringement on electrical welding patents. It was found that the complainant, the defendants and others had been applying the teachings of the Bernados method of electrical welding, as improved upon by Coffin and Kjellberg through the use of a metal electrode. They had found that under certain relative conditions of size of parts and strength and quantity of current, an experienced workman could weld upon an overhead surface, but Siemund was the first man who described to the patent office, or who expressed in writing a definite description of the proportion and arrangement of the entire apparatus and the method of the manipulation of the parts when making a successful overhead weld. The court found that such a description was not the invention of a method; also that an arrangement of the parts of a device cannot be patentable as a new invention when the earlier patents show both an understanding of the possibility of these results and the existence of such an arrangement of parts and of the conditions produced, even though the explanation of the cause of the results themselves be mistakenly stated. For seven or eight years prior to the Siemund experiments, Enderlin was welding by the method of electric current, of substantially the proportions needed for the Siemund method, and by the use of a metallic electrode of such small size as to produce a voltaic arc, manipulated in almost the identical way which Siemund later patented. The court decided that even if the particular improvements upon the Bernados method were patentable, or if the particular device showed patentable novelty, the Siemund patent must be held invalid when tested from the standpoint of the defendant's prior use.

**INDO-CYAN RAILWAY CONNECTION.**—Work on the Indo-Ceylon connection, South Indian Railway, is proceeding steadily. More than two-thirds of the earthwork is finished.

## Railway Construction.

**ALGOMA CENTRAL & HUDSON BAY.**—The Algoma Eastern has been extended from Crean Hill, Ont., southwest to Espanola, 26 miles.

**ALGOMA EASTERN.**—See Algoma Central & Hudson Bay.

**ALVA & NORTHWESTERN.**—Under this name a line is projected from Alva, Okla., it is said, northwest to a connection with the Chicago, Rock Island & Pacific at Bucklin, Kan., about 80 miles. W. E. DeFord, Billings, Mont., is the promoter.

**BIRMINGHAM & SOUTHEASTERN.**—This road has been extended from Tallassee, Ala., north to Electric, 14 miles.

**BUTTE-BOISE-WINNEMUCCA.**—An officer of this company, which was recently incorporated in Idaho, with \$40,000,000 capital, is quoted as saying that construction work will be started at once on a section extending east and west from Boise, Idaho. The plans call for building from a point near Anaconda, Mont., south to Armstead, thence via Salmon City, Idaho, and southwest via Challis to Boise City, then through Oregon to Winnemuca, Nev. L. O. Leonard, Boise, is president. (June 13, p. 1342.)

**CALGARY & FERNIE.**—The subsidy voted by the Canadian government in 1912, for a line from a point between Michel, B. C., and Sparwood northerly via the headquarters of Elk river and Kananaskis Pass to Calgary, Alta., 100 miles, has been renewed. Work on the line is to be started from a point near Fernie. The directors include G. A. Fraser and S. S. Mahon.

**CANADIAN PACIFIC.**—A new branch of the Esquimalt & Nanaimo, called the Cowichan Lake subdivision, has been opened for business from Hayward Junction, B. C., west to Cowichan Lake, 18 miles.

**CORINTH & NORTHEASTERN.**—This company, which was recently organized by residents of Corinth, Miss., is making financial arrangements to build from Corinth, Miss., northeasterly to the Tennessee river and to Savannah, Tenn. The plans call for ultimately extending the line to Nashville. The city of Corinth proposes to issue bonds for \$50,000 to provide terminal facilities in that city, and the county of Hardin to issue \$100,000 of bonds in aid of the project. Clopton Thomas, secretary of the Business Men's Club, Corinth, may be addressed. (June 6, p. 1244.)

**ESQUIMALT & NANAIMO.**—See Canadian Pacific.

**GRAND RAPIDS & INDIANA.**—The line, formerly in operation between Cadillac, Mich., and Lake City, has been extended from Lake City to Falmouth, 8.6 miles.

**GRAND TRUNK PACIFIC.**—A new line has been opened for business on the Prairie division, called the Oban & Battleford subdivision, from Oban, Sask., north to Battleford, 48.5 miles.

**HALIFAX TERMINAL.**—See Intercolonial Railway.

**INTERCOLONIAL RAILWAY.**—Contracts have been given to the Cook Construction Company, Sudbury, Ont., and to A. B. Wheaton, Amherst, Nova Scotia, it is said, for building a five mile line from Rockingham, Nova Scotia, under the name of the Halifax Terminal. It is understood that the contracts are worth \$1,500,000.

**KNOXVILLE & MARYVILLE INTERURBAN.**—Application is to be made for a charter in Tennessee, it is said, by this company, with capital of \$10,000. The plans call for building from Vestal, Tenn., south to Maryville, about 15 miles. The line may eventually be extended southwest to Madisonville, in all about 45 miles. H. Cornick, C. M. Seymour and R. M. Mitchell are incorporators.

**MARGAREE COAL & RAILWAY.**—The Canadian parliament has granted this company a subsidy, not to exceed \$6,400 a mile, in place of the subsidy voted in 1911, for the following lines: From the Intercolonial Railway near Orangedale, N. S., to St. Rose, 46 miles; from a point on the same road near McIntyre Lake, to Caribou Cove, Port Malcolm, 4 miles. Construction work has not yet been started, but it is understood that financial arrangements have been made for carrying out the work at once. A. W. Chisholm, J. D. Taylor, C. E. Sherman and T. S. Courtenay are interested.

**MARYVILLE-KNOXVILLE INTERURBAN.**—Organized with \$10,000 capital and headquarters at Knoxville, Tenn., it is said, to build a 14-mile line from Maryville north to Knoxville. T. G. McConnell and J. H. Frantz are interested.

**NAAS VALLEY & NORTHERN.**—Incorporation has been asked for in Canada by this company, to build from the mouth of the Naas river to Stikeen river, British Columbia, thence northerly along Teslin lake to Yukon territory. Smith & Johnston, Ottawa, Ont., are solicitors for the applicants.

**OAKWOOD & TRINITY RIVER SOUTHERN.**—Incorporated in Texas with \$100,000 capital, and principal office at Oakwood, Leon county. The plans call for building from a point on the International & Great Northern in Leon county, not yet decided upon, south through Leon county to a point in Madison county about 50 miles. The incorporators include J. M. Dobie, W. A. Frisby, J. H. Haile, W. W. Collier and L. Frisby, all of San Antonio; J. W. Barton, Oakwood, and F. S. Streator, Dallas.

**OREGON SHORT LINE.**—A new branch, called the Homedale branch, has been opened for business on the Idaho division from Nyssa, Ore., south to Homedale, Idaho, 25 miles, and a branch on the Montana division has been opened for business from Elva, Idaho, to Menan, 10 miles.

**OLYMPIA SOUTHERN.**—Incorporated in the state of Washington with \$100,000 capital, it is said, to build from Puget Sound to the Columbia river. T. R. Brown, Olympia, and B. H. Rhodes, Centralia, are incorporators.

**PAWHUSKA & NORTHEASTERN.**—Incorporated in Oklahoma, with a capital of \$100,000, to build from Pawhuska, Okla., on the Midland Valley northeast to Bartlesville, also to build from Pawhuska west to Ponca on the Atchison, Topeka & Santa Fe. The incorporators include W. C. Tucker, W. T. Leahy, E. J. McCurdy, A. W. Hurley and H. H. Brenner, Pawhuska.

**PINE BLUFF & SOUTHERN.**—The Railroad Commission of Arkansas has extended to February 15, 1915, the time in which the company shall build 10 per cent. of the line from McCreanor, Ark., south to Pine Bluff, about 40 miles.

**ST. LOUIS, IRON MOUNTAIN & SOUTHERN.**—On the Memphis division a new branch has been opened for business, called the Marianna branch, from Memphis, Tenn., south to Marianna, Ark., 51 miles.

**SALEM, FALLS CITY & WESTERN.**—This road has been extended from West Salem, Ore., to Salem, 1.4 miles.

**SAN ANTONIO, UVALDE & GULF.**—The Gulf division has been extended from Whitsett, Tex., south to Kitty, 16.8 miles.

#### RAILWAY STRUCTURES.

**COCHRANE, ONT.**—Bids are wanted by P. E. Ryan, secretary of the Commissioners of the Transcontinental Railway, at Ottawa, Ont., until July 22, 1913, for building an ice house, store house, freight house, and two tool houses at Cochrane, Ont. Plans on file at the offices of Gordon Grant, chief engineer, Ottawa, and of T. S. Armstrong, district engineer, Cochrane.

**PHILMONT, PA.**—An officer of the Philadelphia & Reading writes that a contract has been given to Enos L. Seeds, Philadelphia, Pa., for putting up a brick and hollow tile passenger station at Philmont on the New York branch in Montgomery county. The structure is to be 29 ft. high, 33 ft. wide, and 38 ft. 3 in. long.

**PITTSBURGH, PA.**—Plans for the North Side freight station of the Pennsylvania Railroad are being made, and it is expected that construction work will be started this summer. The station will extend along North Canal street, from Federal to Anderson streets, for a distance of 912.9 ft. The structure will be of brick construction with terra cotta trimmings. It will consist of a four-story office structure fronting Federal street, with a two-story warehouse extending back to Anderson street, the second story spanning Sandusky street. The tracks are to enter the building at the height of the second floor. Between it and the Fort Wayne roadbed five additional tracks and a covered transfer platform more than 1,000 ft. long will be constructed. The contract for the work has not yet been let.

## Railway Financial News.

**CASSVILLE & WESTERN.**—This five-mile road, running from Cassville, Mo., to Exeter, has been sold under foreclosure for \$31,050.

**MISSOURI, KANSAS & TEXAS.**—This company has bought the Sugar Land Railroad. The Sugar Land Railroad runs from Cabell, Tex., to La Prele, 19 miles.

**NEW ORLEANS, TEXAS & MEXICO.**—Vice-President and General Manager A. D. Lightener has been appointed temporary receiver of this subsidiary of the St. Louis & San Francisco.

**NEW YORK CENTRAL & HUDSON RIVER.**—United States Senator Norris, of Nebraska, has introduced a resolution in the Senate providing for an inquiry into the New York Central's proposed plan for merging its property with the Lake Shore & Michigan Southern.

**NEW YORK, NEW HAVEN & HARTFORD.**—See New York, Westchester & Boston.

**NEW YORK, WESTCHESTER & BOSTON.**—The *Wall Street Journal* says that in June, for the first time, this subsidiary of the New York, New Haven & Hartford, which was built at a cost of approximately \$35,000,000, earned its operating expenses. The fixed charges on the investment are, of course, still being carried by the New Haven.

**NORTHERN PACIFIC.**—The First National Bank, the National City Bank and J. P. Morgan & Co., all of New York, bought from the railroad company and have entirely sold \$10,000,000 one-year 6 per cent. notes of the Northern Pacific. The price at which the notes were issued was 99 3/4. The notes are a general credit obligation of the railroad.

**OAKLAND, ANTIOCH & EASTERN.**—The California railroad commission has authorized this company to issue \$1,000,000 additional first mortgage 5 per cent. bonds, making the total amount of outstanding bonds \$4,000,000.

**ST. LOUIS & SAN FRANCISCO.**—M. de Peyster, who has been one of the inspectors of the Minister of Finance of France, has been ordered by the French government to make an investigation of the financial position of the St. Louis & San Francisco.

See St. Louis, Brownsville & Mexico and New Orleans, Texas & Mexico.

**ST. LOUIS, BROWNSVILLE & MEXICO.**—Frank Ball, of Houston, of the firm of Andrews, Ball & Streetman, has been appointed receiver of this subsidiary of the St. Louis & San Francisco.

**SUGAR LAND RAILROAD.**—See Missouri, Kansas & Texas.

**WABASH.**—See Wheeling & Lake Erie.

**WHEELING & LAKE ERIE.**—Under the direction of the court, the Wabash, on August 1, will default on the interest on the Wheeling & Lake Erie notes, which are guaranteed principal and interest by the Wabash. The notes, originally amounting to \$8,000,000, now amount to about \$10,000,000. The Wabash had been paying interest on these notes for the past year under an agreement with the noteholders, but the court now holds that it can no longer pay this interest.

**IMPORTANT CHINESE RAILROAD PROPOSED.**—The most important railway that has been projected in China for many years is that which is destined to connect the sea with Lanchow, the capital of Kansu province. It will pass through four provinces, Kansu, Shensi, Honan and Kiangsu, and therefrom it derives its name, the "Lung-Tsing-U-Hai Railway"—"Lung," meaning Kansu, "Tsing," Shensi, "U," Honan, and "Hai," the sea. It will pass through Sian-fu (the capital of Shensi province), Tung-kwan, Honan-fu, Kaifeng-fu (the capital of Honan province), Kweiteh-fu, and Suchow-fu in the province of Kiangsu, to the sea. It will also penetrate one of the most important sections of China on its way from Honan westwards, by following the famous Tungkwan road. This is probably the greatest military road in China, and is supreme in importance in a strategical and political aspect, as it mediates without exception the natural traffic between the southwest of the republic and Peking.